SAMPLING AND ANALYSIS PLAN/QUALITY ASSURANCE PROJECT PLAN (SAP/QAPP) GULFPORT TURNING BASIN

Prepared for

Mississippi State Port Authority at Gulfport

U.S. Army Corps of Engineers

Prepared by

Anchor QEA, LLC

614 Magnolia Avenue

Ocean Springs, Mississippi 39564

October 2012

1.0 ELEMENT A1 – TITLE AND APPROVAL SHEET

Title: (Add Project Full Title here)

Organization/Applicant: Mississippi State Port Authority at Gulfport

Technical Manager: Joseph Conn

Signature: _____ Date: _____

QA Manager (if applicable):

Signature: _____ Date: _____

Regulatory Agency: USEPA Region 4

Project Manager: Doug Johnson

Signature: _____ Date: _____

QA Manager (if applicable):

Signature: _____ Date: _____

Regulatory Agency: USACE District

Regulatory Division Project Manager: Damon Young

Signature: _____ Date: _____

Sediment Testing Specialist: Jennifer Jacobsen

Signature: _____ Date: _____

QA Manager (if applicable):

Signature: _____ Date: _____

Contractor 1:

Project Manager: Wendell Mears

Signature: _____ Date: _____

Field QA Officer: Sarah Ballard

Signature: _____ Date: _____

QA Manager: Cindy Fields

Signature: _____ Date: _____

1.0 ELEMENT A1 – TITLE AND APPROVAL SHEET

Title: (Add Project Full Title here)

Organization/Applicant: Mississippi State Port Authority at Gulfport

Technical Manager: Joseph Conn
Signature: _____ Date: 10/2/12
QA Manager (if applicable):
Signature: _____ Date: _____

Regulatory Agency: USEPA Region 4

Project Manager: Doug Johnson
Signature: _____ Date: 10/19/12
QA Manager (if applicable):
Signature: _____ Date: _____

Regulatory Agency: USACE District

Regulatory Division Project Manager: Damon Young
Signature: _____ Date: 10/3/12
Sediment Testing Specialist: Jennifer Jacobsen
Signature: _____ Date: _____
QA Manager (if applicable):
Signature: _____ Date: _____

Contractor 1:

Project Manager: Wendell Mears
Signature: _____ Date: 10/2/2012
Field QA Officer: Sarah Ballard
Signature: _____ Date: 10/2/2012
QA Manager: Cindy Fields
Signature: _____ Date: _____

2.0 ELEMENT A2 – TABLE OF CONTENTS

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3.0 ELEMENT A3 – DISTRIBUTION LIST

This document is to be distributed the following individuals for review and approval prior to commencement of sampling activities:

1. USACE Technical Manager: Damon Young
2. USACE QA/QC Manager:
3. USEPA Project Manager: Doug Johnson
4. USEPA QA/QC Manager:
5. Contractor Project Manager: Wendell Mears (Anchor QEA, LLC)
6. Contractor QA/QC Manager: Cindy Fields (Anchor QEA, LCC)

4.0 ELEMENT A4 – PROJECT/TASK ORGANIZATION

Project/task organization are described in Sections 4.1 through 4.3 below.

4.1 List of Acronyms

°C	degree Celsius
µg	microgram
BP	bioaccumulation potential
BU	beneficial use
cc	cubic centimeter
CFR	Code of Federal Regulations
COC	chain-of-custody
CY	cubic yard
DEM	Digital Elevation Model
DQO	data quality objective
DU	dredge unit
EC_{50}	median effective concentration
EDD	electronic data deliverable
EIS	Environmental Impact Statement
ERED	Environmental Residue-Effects Database
ER-L	effects range low
FDA	U.S. Food and Drug Administration
G	gram
HDPE	high-density polyethylene
ITM	Evaluation for Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual
Kg	kilogram
L	liter
LC_{50}	median lethal concentration
LCS	laboratory control sample
LDPE	low-density polyethylene
LPC	limiting permissible concentration
MDL	method detection limit

mg	milligram
mL	milliliter
MLLW	mean lower low water
MSPA	Mississippi State Port Authority
NAD	North American Datum
NOAA	National Oceanic and Atmospheric Administration
ODMDS	Ocean Dredged Material Disposal Site
OTM	Evaluation for Dredged Material Proposed for Ocean Disposal – Testing Manual
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	probable effects level
QA/QC	quality assurance/quality control
QES	Quality Engineering Services, Inc.
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
SAD	South Atlantic Division
SAP	Sampling and Analysis Plan
SAR	Sampling and Analysis Report
SERIM	Southeast Regional Implementation Manual
SESI	Southern Earth Science, Inc.
SIM	selective ion monitoring
SP	solid phase
SPP	suspended particulate phase
SRM	standard reference material
STFATE	Short-Term FATE
SVOC	semi-volatile organic compound
T0	time zero
TBT	tributyltin
TCLP	toxicity characteristic leaching procedure
TEL	threshold effect level
TOC	total organic carbon
TPH	total petroleum hydrocarbons

USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
WQC	water quality criteria
WQS	water quality standards

4.2 Dredging Project Proponent

Applicant: Mississippi State Port Authority – Port of Gulfport
Regulatory: USEPA Region 4, U.S. Army Corps of Engineers, Mobile District
See below for contact information.

4.3 Dredging Team and Responsibilities

Organization: U.S. Army Corps of Engineers, Mobile District
Project Manager: Damon Young
USACE, Mobile District
P.O. Box 2288
Mobile, Alabama 36628-0001
Phone: (251) 599-9663
Email: Damon.M.Young@usace.army.mil
Responsibilities: Permit the Gulfport Expanded Turning Basin.

Organization: U.S. Environmental Protection Agency
Project Manager: Doug Johnson
U. S. Environmental Protection Agency
Region 4 – WMD/WCNPS/Coastal
61 Forsyth Street, SW
Atlanta, Georgia 30303
Phone: (404) 562-9386
Email: Johnson.Doug@epamail.epa.gov
Responsibilities: Determine suitability of dredged material for ocean disposal in accordance with the OTM (USEPA 1991), the SERIM (USEPA Region 4/USACE 2008), and the ITM (USEPA 1998).

Organization: Mississippi State Port Authority – Port of Gulfport
Project Manager: Joseph Conn
2510 14th Street, Suite 1450
Gulfport, Mississippi 39501
Phone: (228) 865-4300
Email: jconn@shipmspa.com
Responsibilities: Oversight of project work and deliverables; ensure project objectives are met.

Contractor 1: Anchor QEA, LLC
Project Manager: Wendell Mears
614 Magnolia Avenue
Ocean Springs, Mississippi 39564
Phone: 228-818-9626
Email: wmears@anchorqea.com
Responsibilities: Overall project coordination including production of all project deliverables, QA/QC, collection of sediment samples and submittal to designated laboratories for physical, chemical, and biological analyses, and coordination with USEPA/USACE, MSPA, and subcontractors to ensure timely and successful completion of the project.

Subcontractor 1: Quality Engineering Services, Inc.
Project Manager: John Oliver
626-D West Railroad Street
Long Beach, Mississippi 39560
Phone: (228) 868-6618
Email: john@qesonline.com
Responsibilities: In charge of all field activities including core collection and processing, field safety, and communication with coring and vessel subcontractors.

Subcontractor 3: Southern Earth Science, Inc.
Project Manager: Bill Brenner
762 Downtowner Loop West
Mobile, Alabama 36616

Phone: (251) 454-4361
Email: b.brenner@soearth.com
Responsibilities: In charge of operating, maintenance and safety of coring equipment; coordinate with Shallow Draft Marine Shipping and Barging Transportation Consulting regarding vessel operations.

Chemistry Laboratory 1: Test America - Mobile
Project Manager: Mike Nance
900 Lakeside Drive
Mobile, Alabama 36693-5118
Phone: (251) 666-6633
email: Mike.Nance@TestAmericaInc.com
Responsibilities: Sample holding and archiving, laboratory preparation and analysis for sediment, elutriate, and tissues.

Toxicology Laboratory 1: TRAC – Biomonitoring Services Laboratory
Project Manager: Dan Johnson
14 South Second Street
Pensacola, Florida 32507
Phone: (850) 456-5836
Email: traclab@bellsouth.net
Responsibilities: Sample holding and archiving, laboratory preparation and analysis for Suspended Phase, Solid Phase, and Bioaccumulation Potential analyses.

Mr. Joseph Conn, Director of Disaster Recovery for MSPA, is the program manager for this effort, assisted by the CH2M HILL Program Management Office.

Mr. Wendell Mears of Anchor QEA, LLC will be the project manager for this sediment sampling activity. Mr. Mears will be responsible for overall project coordination, including:

- Production of all project deliverables.
- Collection and submittal of environmental samples to designated laboratories for physical, chemical, and biological analyses.
- Administrative coordination to ensure timely, successfull completion of the project.

Mr. Mears will be involved in all aspects of this project, including coordination with USEPA and/or USACE; discussion, review, and approval of the SAP; and interpretation of analytical results and reporting. Mr. Mears and/or his designee will be responsible for all decisions concerning sample collection and ensuring that appropriate protocols for decontamination, sample preservation, and holding times are observed.

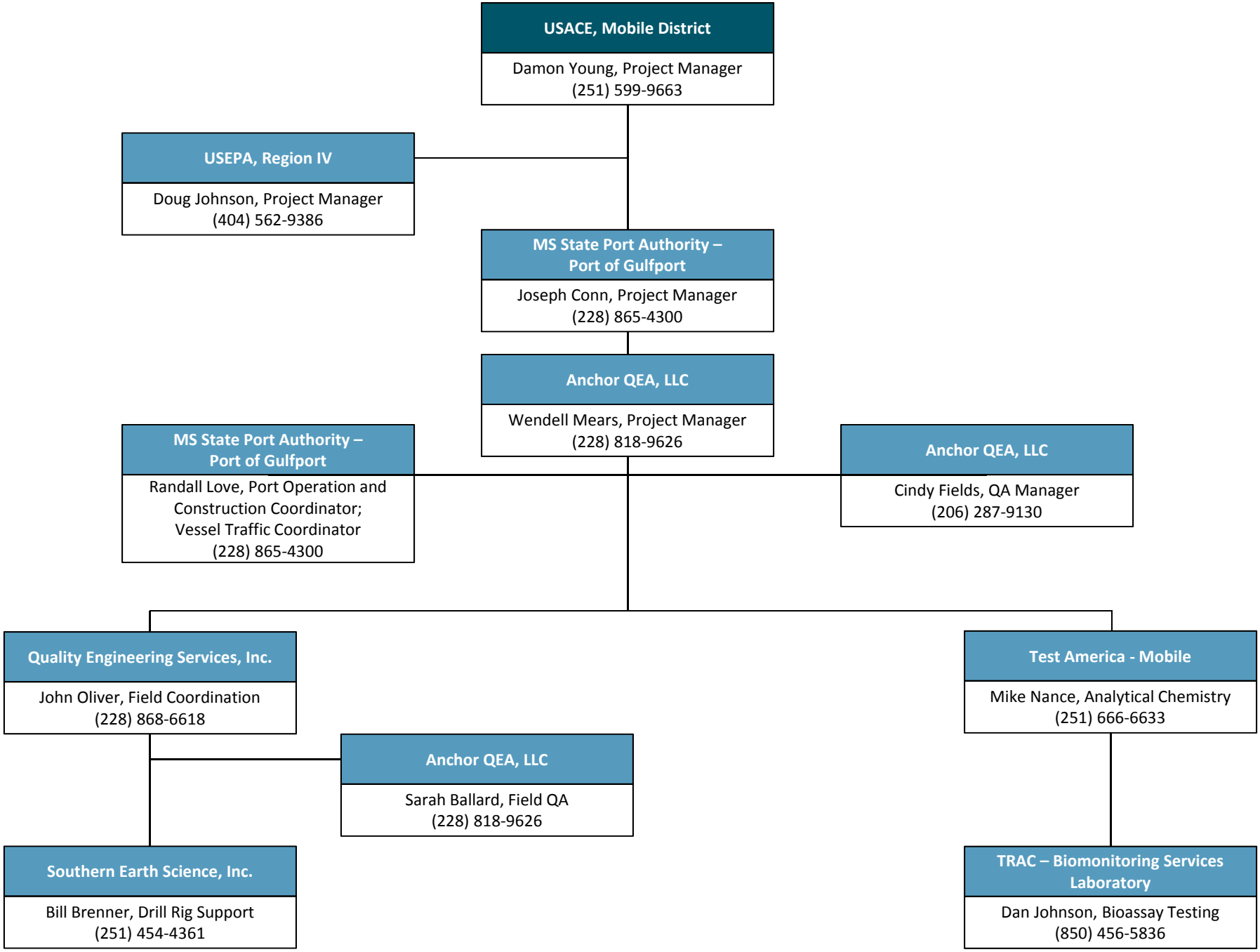
All field activities will be performed under the direction of Quality Engineering Services, Inc. (QES's) field coordinator, Mr. John Oliver. Mr. Oliver will coordinate with and oversee the subcontractors listed in Table 1 and will communicate with Mr. Randall Love prior to conducting work in Port to ensure that sampling activities do not interfere with Port operations or traffic. Ms. Sarah Ballard of Anchor QEA will serve as the quality assurance (QA) representative for the Port of Gulfport during field activities. She will ensure samples are collected, documented and handled appropriately. During coring, the vessel will be staffed with a captain and field technicians (to operate the drill rig and to log and process the core samples). The vessel will be supplies and operated by Shallow Draft Marine. The drill rig equipment will be supplied and operated by Southern Earth Science, Inc. (SESI).

Ms. Cindy Fields will serve as Anchor QEA's QA manager. She or her designee will provide QA oversight for both the field sampling and laboratory programs, coordinate with the analytical laboratories, ensure data quality, oversee data validation, and supervise project QA coordination. QA responsibilities include ensuring that all laboratory analyses meet the project data quality objectives (DQOs) and other specifications required by OTM (USEPA/USACE 1991), ITM (USEPA/USACE 1998), and SERIM (USEPA Region IV/USACE SAD 2008) guidelines.

The contract laboratories are expected to meet the following minimum technical requirements, as specified in the negotiated subconsultant agreement with QES:

- Adhere to the methods outlined in this SAP.
- Deliver electronic data files as specified.
- Meet all reporting requirements.
- Implement QA/quality control (QC) procedures outlined in this SAP and required by OTM (USEPA/USACE 1991), ITM (USEPA/USACE 1998), and SERIM (USEPA Region IV/USACE SAD 2008) guidelines.

- Allow Anchor QEA to perform laboratory and data audits, if necessary.
- Follow documentation, chain-of-custody (COC), and sample logbook procedures.
- Meet turnaround times for deliverables.


USACE, Mobile District
Damon Young, Project Manager
(251) 599-9663
USEPA, Region IV
Doug Johnson, Project Manager
(404) 562-9386
MS State Port Authority – Port of Gulfport
Joseph Conn, Project Manager
(228) 865-4300
Anchor QEA, LLC
Wendell Mears, Project Manager
(228) 818-9626
MS State Port Authority – Port of Gulfport
Randall Love, Port Operation and Construction Coordinator; Vessel Traffic Coordinator
(228) 865-4300
Anchor QEA, LLC
Cindy Fields, QA Manager
(206) 287-9130
Quality Engineering Services, Inc.
John Oliver, Field Coordination
(228) 868-6618
Anchor QEA, LLC
Sarah Ballard, Field QA
(228) 818-9626
Test America - Mobile
Mike Nance, Analytical Chemistry
(251) 666-6633
Southern Earth Science, Inc.
Bill Brenner, Drill Rig Support
(251) 454-4361
TRAC – Biomonitoring Services Laboratory
Dan Johnson, Bioassay Testing
(850) 456-5836

5.0 ELEMENT A5 – PROBLEM DEFINITION/BACKGROUND

5.1 Background/Site History

The Port of Gulfport, Mississippi is a bulk, break-bulk, and container seaport centrally located on Mississippi's Gulf of Mexico coastline (Figure 1). Recognized as the region's third busiest container port, the Port of Gulfport is developing long-term management and expansion plans. To facilitate the proposed future expansion, the Mississippi State Port Authority (MSPA) is proposing to conduct construction (new work) dredging within a proposed turning basin immediately adjacent and south of the existing turning basin footprint. The proposed turning basin would aid in the safe navigation of vessels approaching a planned new wharf immediately south of the existing West Pier.

Over the last 10 years, two projects have required the evaluation of dredged material within the vicinity of the turning basin: the Gulfport West Pier Expansion (evaluated in 2002) and the Federal Navigation Channel (evaluated in 2004). The results indicate that, historically, dredged material from the vicinity of the turning basin has been found suitable for open ocean disposal.

5.1.1 Gulfport West Pier Expansion 2002

In July 2002, Thompson Engineering and URS Corporation (2003) conducted sediment sampling in the West Pier Expansion area. Nine sediment samples (GP02-01 thru GP02-09) were collected and submitted to analytical laboratories for a full Tier III dredged material evaluation. Five of the samples (GP02-03, GP02-05, GP02-06, GP02-08, and GP02-09) were located within the proposed turning basin footprint, which is the focus of the current sampling effort. Sediment samples were collected to depths between -38.3 and -41.6 feet MLLW. The material ranged from silt to silty sand. Chemistry analyses were conducted on each individual core. Most all metals were detected in low concentrations below relevant effect levels (e.g., effects range-low [ER-L] developed by Long et al. 1995). Antimony, cadmium, selenium, silver, and thallium were not detected in any samples. Arsenic was the only metal to be detected at levels slightly above its ER-L. No organic contaminants (polycyclic aromatic hydrocarbons [PAHs], semi-volatile organic compounds [SVOCs], chlorinated pesticides, or polychlorinated biphenyls [PCBs]) were detected in any samples, with the exception of one individual congener in one sediment sample.

Bioassay and bioaccumulation potential (BP) tests were conducted on three composite samples (three cores per composite sample). Bioassay testing included two solid phase (SP) tests using *Leptocheirus plumulosus* and *Nereis arenaceodentat*a, two suspended particulate phase (SPP) tests using *Menidia beryllina* and *Americamysis bahia* (formerly *Mysidopsis bahia*), and one fertilization test using *Lytechinus pictus*. Results of the bioassay tests suggested that project sediment was not acutely toxic to aquatic organisms. Survivorship in the organisms (*Macoma nasuta* and *Nereis virens*) used for the bioaccumulation test was acceptable and tissues samples were analyzed for arsenic and mercury concentrations. Arsenic and mercury concentrations in *M. nasuta* tissue samples exposed to project sediment, as well as mercury concentrations in *N. virens* tissue samples, were not significantly greater than concentrations in tissue samples exposed to the project reference sediment sample. Arsenic concentrations in *N. virens* tissue samples exposed to project sediment were significantly greater than arsenic concentrations in tissue samples exposed to project reference sediment; however, arsenic concentrations in *N. virens* tissues exposed to project sediment were at or below arsenic concentrations in day zero tissue samples. Further, mercury and arsenic measured in tissue samples from either organism were below the U.S. Food and Drug Administration's (FDA) action levels.

These results suggested sediments from the West Pier Expansion Area, including sediment from within the proposed turning basin, were suitable for ocean placement.

5.1.2 Gulfport Harbor Federal Navigation Channel 2004

In 2004, EA Engineering, Science and Technology (EA 2006) conducted an evaluation of dredged material within the Gulfport Harbor Federal Navigation Channel for the USACE. Fifteen samples were collected throughout the Gulfport Harbor Anchorage Basin and the Sound Channel to support proposed alternatives for the widening and deepening of the federally authorized navigation channel and basin. In the vicinity of the proposed turning basin, several samples were evaluated to support maintenance, deepening, or widening alternatives (GH04-01-M, GH04-01-D, GH04-02-M, GH04-02-D, GH04-03-DW, and GH04-03-W); the results of these specific samples are summarized herein. Sediment samples were collected to project depths between -36 and -38 feet MLLW (depending on the proposed alternative). Sediment was predominantly sand. Metals were detected in low

concentrations (i.e., below relevant effects levels) in all samples with a couple exceptions. Arsenic and nickel was detected in GH04-02-M in concentrations slightly greater than their respective threshold effect levels (TEL). With the exception of PCBs, organic contaminants (PAHs, SVOCs, or chlorinated pesticides) were either non-detect or detected in low concentrations. In GH04-02-D, total PCBs was detected above its TEL by a factor of 5.6.

Bioassay and BP tests were conducted on three composite samples (three cores per composite sample). Bioassay testing included two SP tests using *L. plumulosus* and *N. arenaceodentat*a, two SPP tests using *Arbacia punctulata, A. bahia*, and *Cyprinodon variegatus*. Results of the bioassay tests suggested that project sediment was not acutely toxic to aquatic organisms, with the exception of SPP tests conducted using sediment from GH04-03-DW; however, Short-Term FATE (STFATE) modeling suggested that the limiting permissible concentration (LPC) would be met within the temporal and spatial boundaries of the placement area. Survivorship in the organisms (*M. nasuta* and *N. virens*) used for the bioaccumulation test was acceptable and tissues samples were analyzed for metals, PCB congeners, and dioxin and furan congeners. In all cases, PCB congeners and dioxin and furan congeners exposed to project sediment were not significantly greater than concentrations in tissue samples exposed to the project reference sediment sample. A variety of metals were detected in *M. nasuta* and *N. virens* tissue samples exposed to project sediment; however, further analysis indicated the uptake ratios were less than one, and/or the metal was either not bioavailable or tended not to bioaccumulate.

These results suggested sediments from the Gulfport Harbor Anchorage Basin and navigation channel, within the vicinity of the proposed turning basin, were suitable for ocean placement.

5.2 Identification of Principal Data Users and Decision Makers

Agency Organization	Location	Area(s) of Responsibility
USACE South Atlantic Division	Mobile, AL	Provide permits for Gulfport Turning Basin Expansion dredging/construction
USEPA Region 4	Atlanta, GA	Review data to determine if ocean disposal suitability requirements have been met based on the OTM (USEPA 1991), the SERIM (USEPA Region 4/USACE 2008), and the ITM (USEPA 1998); oversee disposal and management of nearby ODMDS': Gulfport Eastern/ Western, or Pascagoula

6.0 ELEMENT A6 – DREDGING PROJECT/TASK DESCRIPTION

6.1 Purpose/Background

6.1.1 General Background

The Port of Gulfport is located in Gulfport, Harrison County, Mississippi (Figure 1). Construction dredging is planned within a proposed turning basin immediately adjacent to the existing turning basin, increasing the overall turning basin's effective area. The proposed turning basin would support commercial navigation and aid in the safe navigation of vessels approaching a planned new wharf immediately south of the existing West Pier.

Current project designs will increase the navigational depths within the proposed turning basin to -40 feet mean lower low water (MLLW). This represents a design depth of -36 feet MLLW plus a 2 feet advanced maintenance (combined, hereto forward referred to as a project depth of -38 feet), plus 2 feet of allowable overdepth (tolerance). Existing bathymetry within the Port of Gulfport is shown on Figure 2. These data were extracted from the National Oceanic and Atmospheric Administration (NOAA) Digital Elevation Model (DEM) of the Mississippi Gulf Coast region (NOAA 2008)[1].

The total maximum volume of material that would be dredged from within the turning basin is estimated to be approximately 3,472,000 cubic yards (CY); consisting of 3,160,000 CY above project depth and 312,000 CY of allowable overdepth (includes side slopes). The dredge area is approximately 4,212,344 square feet (sf) or 96.7 acres. The proposed dredging within the turning basin has been sectioned into ten dredge units (DUs) for the purpose of sampling and analysis activities (i.e., GP-DU1, GP-DU2, …, GP-DU10; Figure 3). Table 2 summarizes the proposed construction dredging areas and volumes within the turning basin for each DU. Dredging will be conducted using either a bucket or hopper dredge.

The MSPA proposes to characterize material to be dredged from within the turning basin for ocean placement. If suitable for ocean disposal, dredged material may be placed at one of

[1] The Federal Navigation Channel widening project was recently completed; however, the as-built survey data are not currently available from the U.S. Army Corps of Engineers (USACE). This DEM will be supplemented with additional data, as needed, to better characterize the bathymetry in the Turning Basin Expansion footprint.

three nearby USEPA-designated ODMDS: Gulfport Eastern or Western, or Pascagoula. If proposed dredged material from any of the DUs is determined to be not suitable for ocean placement, suitable beneficial use (BU) alternatives will be evaluated.

6.1.2 Permitting

The Port of Gulfport submitted a permit request to the US Army Corps of Engineers, Mobile District in March 2009 for the proposed action and Joint Public Notice SAM-2009-01768-DMY was issued on April 16, 2009. Concurrent with this sampling event, the Port has initiated an Environmental Impact Statement.

6.2 Description of the Sampling and Analysis

6.2.1 Measurements That Are Expected During the Course of the Sediment Sampling

Physical, chemical, and biological analyses expected during the course of sediment sampling are presented in Table 3. Proposed analytical methods and target detection limits are presented in Section 13.3.

6.2.2 Applicable Technical Quality Standards of Criteria

Sediment chemistry data will be compared with existing regulatory guidelines, including screening level values such as the TEL and probable effects level (PEL; MacDonald et al. 1996) or the ER-L and effects range – median (ER-M; Long et al. 1995). If necessary, TCLP chemistry results will be compared to USEPA Title 40 CFR Part 261 values (USEPA 2010) to determine suitability for upland placement.

Water and elutriate chemistry data will be compared with existing regulatory guidelines, such as the USEPA WQC and state water quality standards (WQS). Appendix F of the SERIM (USEPA Region IV/USACE SAD 2008) presents an example of the USEPA WQC; the latest USEPA WQC will be consulted for compliance comparison. If any of the analytical results exceed the WQC, STFATE modeling will be conducted to determine if compliance will be met within the site boundaries after 4 hours of mixing.

Tissue chemistry data will be initially compared against applicable FDA action levels for poisonous or deleterious substances in fish and shellfish for human food, when such levels have been set for the bioaccumulative contaminants of concern. In the absence of action levels, or if tissue contaminant concentrations are statistically less than action levels, results will be compared to tissue concentrations of organisms exposed to reference sediment. If tissue concentrations of organisms exposed to test sediment do not statistically exceed those of organisms exposed to reference sediment, the dredged material meets the LPC requirements for bioaccumulation and may be suitable for open-ocean placement. If tissue concentrations of organisms exposed to test sediment are statistically elevated compared to the organisms exposed to reference sediment, results will first be compared to bioaccumulation screening levels developed by USEPA Region IV (USEPA Region IV/USACE SAD 2008). Contaminant concentrations that exceed these bioaccumulation screening levels will be further assessed based on the criteria specified in the OTM (e.g., toxicological importance of contaminants, magnitude of exceedance, propensity to biomagnify; USEPA/USACE 1991) to determine compliance with the LPC. This assessment will include a comparison to residue-effects values provided in the USACE/USEPA Environmental Residue-Effects Database (ERED; USACE/USEPA 2009).

SP and SPP test results will be evaluated in accordance with guidelines described in the OTM (USEPA/USACE 1991) and ITM (USEPA/USACE 1998), as described in Section 19.2.

6.2.3 Special Personnel or Equipment Requirements That May Indicate the Complexity of the Dredging Project

Sediment sampling will be conducted using a drilling rig secured to a geotechnical boring platform. This equipment is being used instead of the typical vibracore sampling device due the need to collect sediment to a depth of 29 feet; typical vibracore systems have an operational limit of 20 feet. Sediment core samples will be collected at each sampling location to the project depth (-38 feet MLLW) plus 2 feet of overdepth or to refusal depth, whichever is encountered sooner.

6.2.4 Assessment Techniques Needed for the Dredging Project

Samples collected as part of this project will be collected as part of a one-time event in a localized area in the Port of Gulfport; no long-term monitoring requirements are necessary. Sampling and analyses associated with this program are expected to be fairly uncomplicated, with the exception of the depth requirements for some samples that exceed 25 feet and require collection by drilling rig instead of vibracore sampler. Assessment techniques described in Section 20 are adequate to ensure that quality objectives will be met. As described in Section 20, there are multiple levels of oversight and quality control established as part of the sampling and analysis program to ensure that quality objectives will be met.

6.2.5 Schedule for the Work Performed

See attached schedule.

Schedule for Work to be Performed

Task	Week																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Field sampling																				
Initiate sediment chemistry; prepare and initiate elutriate chemistry; initiate suspended particulate phase bioassay testing																				
Continue sediment and elutriate chemistry, bioassay tests; initiate solid phase and bioaccumulation potential tests																				
Continue sediment and elutriate chemistry, bioassay and bioaccumulation potential tests																				
Continue sediment and elutriate chemistry, bioassay and bioaccumulation tests																				
Evaluate sediment chemistry data; continue bioaccumulation tests																				
Evaluate bioaccumulation test data; initiate tissue chemistry																				
Continue tissue chemistry																				
Data QA/QC																				
Initiate and continue reporting																				
Draft Report submitted																				
Review draft report																				
Comments received draft report																				
Address comments; develop final report																				
Submit final report																				

6.2.6 Dredging Project and Quality Records Required, Including the Types of Reports Needed

The following reports will be submitted:

1. Sampling and Analysis/draft Quality Assurance Project Plans (SAP/QAPP) submitted for review and comment.
2. Final Quality Assurance Project Plan (SAP/QAPP), after revisions based on comments for final approval prior to sampling.
3. Site-Specific Health and Safety Plan – Accident Prevention Plan.
4. Daily Field Reports. A daily field report will be prepared by the Field Team Coordinator or Project Manager after each day sampling is completed. This report describe the location(s) of sampling, samples collected, general field conditions, sampling plan divergences, and corrective actions, and will be an appendix to the Final Sediment Testing Report.
5. Chemical Quality Assurance Report (CQAR). The CQAR describes the overall quality and usability of the data as part of the project field sampling and laboratory analyses. The CQAR will be based on a data quality review of all daily field reports and results of external analytical data validation and will identify any issues or deficiencies that would impact the data quality objectives specified in the SAP/QAPP. This report will be an appendix to the Final Sediment Testing Report.
6. Preliminary Sediment Chemistry Data Report.
7. Final Sediment Evaluation Testing Report, after comments and associated revisions.

7.0 ELEMENT A7 – QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Laboratory QC objectives are presented in Table 4. The frequency of analysis for laboratory QA/QC samples are summarized in Table 5. QC summary tables are also presented in Appendix O of the SERIM (USEPA Region IV/USACE SAD 2008). When analyzing chemical parameters, USEPA methods require that initial calibrations must be completed before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet acceptance criteria. Ongoing calibrations are required at the frequencies listed in Table 5. Surrogates are required for all organic methods. Additional QA/QC samples include laboratory replicates, matrix spike samples, method blanks, laboratory control samples (LCSs), and standard reference materials (SRMs).

All samples will be diluted and re-analyzed if target compounds are detected at levels that exceed their respective established calibration ranges. Any sample cleanup procedure will be conducted prior to the dilutions. If surrogate, internal standard, or spike recoveries are outside of the laboratory QC limits, reanalysis will be performed. QC samples may be reanalyzed if results are not within control limits and the cause cannot be determined to be the sample matrix.

8.0 ELEMENT A8 – SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

Sediment, site water, elutriate, and tissue chemistry will be performed by Test America in Mobile, Alabama. Test America is a NELAC-accredited laboratory (Certificate #E87089-51). TRAC-Biomonitoring Service Laboratory, a sub-consultant to Test America, is a NELAC-accredited laboratory (Certificate #E81181-08). This program ensures standardized procedures and training of personnel.

There are no special training or certification requirements for field personnel for dredged material sampling; however, all personnel will be properly trained in collecting, handling, and processing sediment and water samples. All employees are required to familiarize themselves with the contents of the Health and Safety Plan (HASP) prior to starting work and review during daily safety meetings. It is also strongly recommended that all field personnel have completed OSHA 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) and current first aid and cardiopulmonary resuscitation (CPR) training.

9.0 ELEMENT A9 – DOCUMENTATION AND RECORDS

9.1 Reporting of Results

A final report will be prepared documenting all activities associated with collecting, processing, and analyzing sediment samples. At a minimum, the following will be included in the final report:

- Summary of all field activities, including a description of any deviations from the approved SAP.
- Locations of sediment sampling stations in Mississippi State Plane coordinates (NAD 83) to the nearest foot, and in latitude and longitude in degrees, decimal minutes (to three decimal places). All vertical elevations of mudline and water surface will be reported to the nearest 0.1 foot relative to MLLW.
- A project map with actual sampling locations.
- QA/QC summary for chemical and biological analyses.
- Data results.
- Summary of comparison of chemical and biological results with interpretive criteria.

Field documentation and laboratory reports will be included as appendices.

Field documentation will include sediment core collection forms, photographs, and a description of all sampling activities, sampling personnel, and weather conditions, as well as a record of all modifications to the procedures and plans identified in this SAP. A sediment core collection form will be completed for each sediment core. An example sediment core collection form is included as Appendix A. In addition to standard entries of personnel, date, and time, the form will include information regarding station coordinates, core penetration, and physical characteristics of the sediment, such as texture, color, odor, stratification, and sheen. All entries will be made with an indelible-ink pen. A representative core from each location will be photographed. Project, station identification, attempt number (if more than one attempt), and sample date and time will be labeled on a white board and included in each photograph.

The analytical laboratory will include the following, where applicable:

- **Project Narrative.** This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary should discuss, but is not limited to, QC, sample shipment, sample storage, and analytical difficulties. Any problems encountered, actual or perceived, and their resolutions, will be documented in as much detail as appropriate.
- **COC Records.** Legible copies of the COC forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include all sample shipping container temperatures measured at the time of sample receipt.
- **Sample Results.** The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:
  - Field sample identification code and the corresponding laboratory identification code
  - Sample matrix
  - Date of sample extraction
  - Date and time of analysis
  - Analytical method
  - Weight and/or volume used for analysis
  - Final dilution volumes or concentration factor for the sample
  - Identification of the instrument used for analysis
  - Method detection limits (MDLs)
  - Method reporting limits accounting for sample-specific factors (e.g., dilution and total solids)
  - Analytical results with reporting units identified
  - Data qualifiers and their definitions
- **QA/QC Summaries.** This section will contain the results of the laboratory QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results. No recovery or blank corrections will be made by the laboratory. The required summaries are listed below; additional information may be requested:

- **Method Blank Analysis.** The method blank analysis associated with each sample and the concentration of all compounds of interest identified in these blanks will be reported.
- **Surrogate Spike Recovery.** All surrogate spike recovery data for organic compounds will be reported. The name and concentration of all compounds added, percent recoveries, and range of recoveries will be listed.
- **Matrix Spike Recovery.** All matrix spike recovery data for organic and metal compounds will be reported. The name and concentration of all compounds added, percent recovery and range of recoveries will be listed.
- **Matrix Duplicate.** This information will include the percent recovery and associated relative percent difference (RPD) for all matrix duplicate analyses.
- **Laboratory Control Sample (LCS).** All LCS recovery data for organic and metal compounds will be reported. The name and concentration of all compounds added, percent recovery and range of recoveries will be listed. The RPD for all duplicate analyses will be included.

The bioassay laboratory report will include the following, where applicable:

- **Project Narrative.** This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of testing. This summary should discuss, but is not limited to, QC, sample shipment, sample storage, and testing difficulties.
- **Test Methods.** These methods will include a summary of test conditions for each SP, SPP, and BP test. All methods should be in accordance with guidelines described in the SAP, OTM (USEPA/USACE 1991), and SERIM (USEPA Region IV/USACE SAD 2008), or otherwise noted.
- **Test Results.** These results will include a summary of the following information, when applicable:
  - Test dates
  - Source of control material
  - Source of organisms
  - Water quality measurements
  - Appropriate lethal or sublethal endpoint results for each species
  - LC_{50} or EC_{50}, when appropriate (i.e., SPP tests)

  - Control acceptability statement
  - Summary of reference toxicant test results

- **Statistical Analyses.** Statistical analyses will be performed, when applicable.
- **QA/QC Summaries.** This summary will include a QC review with any protocol deviations and corrective actions taken.
- **Raw Data.** Legible copies of raw data sheets will be used in testing, including water quality, daily observations, and final lethal or sublethal endpoint results.
- **Reference Toxicant Test Data.** These data will include raw data sheets, statistical analyses, and control charts.
- **COC Records.** Legible copies of the COC forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented on a sample receipt form. The form must include all sample shipping container temperatures measured at the time of sample receipt.

9.2 Report Format

The final report will be submitted in both hard copy and electronic versions. The electronic version will be provided in Adobe Acrobat (.pdf) format. Electronic copies for all data will be stored on CD ROM. All electronic data will be provided in an EDD, and all documents will be provided in Adobe Acrobat (.pdf) format.

9.3 Data Reporting Package Archiving and Retrieval

All reports, laboratory data, field forms, photographs, correspondence, and project documentation will be retained by Anchor QEA for a minimum of 5 years. Approval will be obtained from the client prior to disposal of any project related records.

10.0 ELEMENT B1 – SAMPLING PROCESS DESIGN

10.1 Scheduled Dredging Project Activities, Including Measurement Activities

Sampling within the project site, laboratory analysis and reporting will occur prior to start of dredging; material is not expected to change between the completion of sampling and the initiation of dredging.

10.2 Rationale for the Design

The total maximum volume of material that would be dredged from within the turning basin is estimated to be approximately 3,472,000 cubic yards (CY), consisting of 3,160,000 CY above project depth and 312,000 CY of allowable overdepth. The proposed dredging within the turning basin has been sectioned into 10 dredge units (DUs) for the purpose of sampling and analysis activities (i.e., GP-DU1, GP-DU2, …, GP-DU10; Figure 3), following recommendations in the OTM (USEPA/USACE 1991). Three individual samples will be collected within each DU to create a single composite sample for analysis, which meets the number of samples required in the SERIM (USEPA Region IV/USACE SAD 2008) for either homogenous or heterogeneous sediment. Sample locations were chosen with the objective of representing, as accurately as possible, the physical and chemical characteristics of sediments to be dredged. Table 6 summarizes the individual samples, composite sample, and volume for each DU.

The MSPA proposes to characterize material to be dredged from within the turning basin for ocean placement. Testing for ocean placement will include the full suite of physical, chemical, and biological analyses, per the *Southeast Regional Implementation Manual* (SERIM; U.S. Environmental Protection Agency [USEPA] Region IV/U.S. Army Corps of Engineers [USACE] South Atlantic Division [SAD] 2008) and the *Evaluation for Dredged Material Proposed for Ocean Disposal – Testing Manual* (OTM; USEPA/USACE 1991). If suitable for ocean disposal, dredged material may be placed at one of three nearby USEPA-designated ODMDS: Gulfport Eastern or Western, or Pascagoula.

10.3 Design Assumptions

Volume estimates are based on bathymetric data extracted from the NOAA DEM of the Mississippi Gulf Coast region (NOAA 2008). This data is the most recent available and is assumed to be accurate. This DEM will be supplemented with additional data, as needed, to better characterize the bathymetry in the Turning Basin Expansion footprint.

Material from within the turning basin is expected to be homogenous; however, if sediment stratification is present, sediments will be segregated and homogenized based on grain size. This may result in additional composite samples representing vertical layers.

If sampling locations are inaccessible or sediment cores are unable to be collected due to debris or other factors, the station will be relocated within the DU boundaries.

Based on historical data (Section 5.1) material from within the turning basin is expected to be suitable for ocean placement. If proposed dredged material from any of the DUs is determined to be not suitable for ocean placement, suitable beneficial use (BU) alternatives will be evaluated. Testing to meet the State BU protocol consists of bioassay analyses. The bioassay tests recommended herein will satisfy the State BU testing requirements. If BU placement alternatives are not available, then additional toxicity characteristic leachate procedure (TCLP) testing may be conducted on DU specific material, if initial bulk chemistry suggests the material may be classified as hazardous.

10.4 Procedures for Locating and Selecting Environmental Samples

10.4.1 Sampling Locations and Depths

Three stations were identified within each DU for sediment core sampling. Figure 3 shows the layout of the DUs proposed for dredging and the proposed core sampling locations. Station locations were chosen with the objective of representing, as accurately as possible, the physical and chemical characteristics of sediments to be dredged. Cores will be collected at each sampling location to the project depth (-38 feet MLLW) plus 2 feet of allowable overdepth. Target coordinates, estimated mudline elevations, and target core lengths for each station are presented in Table 7. More than one core may be required at each station to obtain sufficient volume for the prescribed testing program.

10.4.2 Nomenclature

Each sediment core location and each individual and composite sediment sample will be assigned a unique alphanumeric identifier using the following format:

- The first two characters identify the Site (e.g., GP for Gulfport).
- The next three or four characters identify the DU (e.g., DU1).
- The remaining characters will be used to identify:
  - The coring location or individual sediment sample collected from that particular core. These two characters will be 01, 02, 03, and so on, and will be repeated for each respective core.
  - The respective composite samples from the DU. The last four characters will be "COMP."

Table 6 lists all of the core and composite sample identification information and associated volumes for each DU.

10.4.3 Compositing Plan

A proportionate volume of sediment from each sample will be combined to create a composite sample for each DU for testing and analysis. Table 8 presents the composite plan and testing strategy for each DU.

10.4.4 Analysis

Specific analyses for each composite sample are presented in Section 13.3.

10.4.5 Field Parameters

A complete record of field activities will be maintained. Recordkeeping will include documentation of field activities and all samples collected for analyses.

The field coordinator will maintain the field logbook. The field logbook will provide a description of all sampling activities, sampling personnel, and weather conditions, as well as a record of all modifications to the procedures and plans identified in this SAP. All entries will be made with an indelible-ink pen. The field logbook is intended to provide sufficient

data and observations to enable readers to reconstruct events that occurred during the sampling period.

A sediment core collection form will be completed for each sediment core. An example sediment core collection form is included as Appendix A. In addition to standard entries of personnel, date, and time, the form will include information regarding station coordinates, core penetration, and physical characteristics of the sediment, such as texture, color, odor, stratification, and sheen.

A representative core from each location will be photographed. Project, station identification, attempt number (if more than one attempt), and sample date and time will be labeled on a white board and included in each photograph.

10.4.6 Reference Site

As the preferred ODMDS has not yet been selected, reference sediment will be collected from one of the designated reference sites for each of the proposed ODMDS following guidelines specified in the SERIM (USEPA Region IV/USACE SAD 2008). For either the Gulfport Eastern or Western ODMDS, reference sediment will be collected from station RS-GP-C. For the Pascagoula ODMDS, reference sediment will be collected from station RS-PAS-A. Reference site locations are shown on Figure 1.

10.5 Classification of Measurements as Critical or Noncritical

Accurate horizontal and vertical positioning of the sample location is critical to ensure all samples are collected within the proposed dredge footprint. Field observations of physical core characteristics are critical in order to determine if sediment cores should be segmented, based on stratification. Physical and chemical analytical results, bioassay test results, bioaccumulation potential test results and tissue chemistry results are critical in determining the suitability of the proposed dredged material for the selected placement option, (e.g., offshore disposal).

10.6 Validation of Any Nonstandard Methods

No modifications to methods are expected in this project. Table 9 presents the recommended analytical methods.

11.0 ELEMENT B2 – SAMPLING AND METHODS REQUIREMENTS

11.1 Describe the Sample Collection, Preparation, and Decontamination Procedures

11.1.1 Field Sampling Schedule

The duration of field sampling is expected to be 15 days pending any delays due to the weather.

11.1.2 Navigation and Vertical Control

On-vessel navigation and positioning will be accomplished using a differential global positioning system. The navigation system will be used to guide the vessel to pre-determined core sampling locations, with an accuracy of plus or minus 10 feet. Horizontal positions will be reported in Mississippi State Plane coordinates (Mississippi State Plane, East, North American Datum [NAD] 83) to the nearest foot and in latitude and longitude in degrees, decimal minutes (to three decimal places).

Upon locating the sampling position, station depth will be measured using an onboard, calibrated fathometer or a leadline. The mudline elevation relative to the MLLW datum will be determined by adding the tidal elevation to the measured depth. All vertical elevations will be reported to the nearest 0.1 foot relative to MLLW.

11.1.3 Sediment Core, Reference Sediment, and Site Water Sample Collection

Field sampling consists of collecting sediment cores at three stations within each DU, for a total of 30 cores (Table 7). Cores will be collected at each sampling location to the project depth (-38 feet MLLW) plus 2 feet of overdepth, or to refusal depth, whichever is encountered sooner.

Sediment will be collected using a drilling rig secured to an 18 by 25 foot jack-up mounted geotechnical boring platform. The drilling rig will consist of a dual tube soil/sediment sampling system. An outer casing will house an inner rod with either a 1.125 or 1.85-inches inner diameter acrylic liner and a catcher to retain the sediment. The outer casing will be driven into the substrate; the inner rod will then be attached to a rod string and placed inside

the outer casing. A hammer will be used to drive the assembly into the benthic floor until the inner rod is filled with sediment. Upon completion of penetration at a station, the drill will be shut down, the position recorded, and the sample recovered. A new liner will be inserted into the core tube prior to sampling at each station to eliminate the possibility of cross contamination among stations.

In addition to project sediment, reference sediment and site water will be collected for biological testing requirements. As the preferred ODMDS has not yet been selected, sediment will be collected from one of the designated reference sites for each of the proposed ODMDS following guidelines specified in the SERIM (USEPA Region IV/USACE SAD 2008). For either the Gulfport Eastern or Western ODMDS, reference sediment will be collected from station RS-GP-C. For the Pascagoula ODMDS, reference sediment will be collected from station RS-PAS-A. Site water will be collected from the dredge area within 1 meter of the bottom, with care not to disturb the sediment. Site water will be collected using a peristaltic pump, or similar methods, and placed in low-density polyethylene (LDPE) cubitainers.

11.1.4 Sample Processing and Preparation

Sediment core samples will be processed onboard the sampling vessel or landside. Physical characteristics of each core will be noted on the individual sediment core collection form (Appendix A). A representative core from each sampling location will be photographed. A 500 –milliliter (mL) aliquot of the bottom two-feet of each core will be archived in the event additional chemistry testing is necessary to delineate the vertical migration of contaminants.

Each core will be visually assessed to determine if sediment stratification is present. If no stratification is present, sediment from each core will be individually homogenized to a uniform consistency in a stainless-steel bowl or high-density polyethylene (HDPE) bucket, whichever can accommodate the collected volume. This includes the entire length of the core. If sediment stratification is present within a core, sediments will be segregated and homogenized based on grain size. A 500- mL subsample of each individual homogenized core will be archived to allow for additional chemical analysis, if necessary.

For cores with no stratification, a proportionate volume, based on relative core lengths, of the homogenized sediment from each core will be combined to form a single composite sample for the DU. For cores where stratification is observed, segregated sediments will not be composited and will instead be tested separately. Sediment will be placed into jars appropriate for physical and chemical analyses, and all jars will be firmly sealed with Teflon-lined lids. Waterproof sample labels will be filled out with an indelible-ink pen and affixed to the sample containers. Each label will contain the project name, sample identification, preservation technique, requested analyses, date and time of collection and preparation, and initials of the person preparing the sample. Remaining sediment (at least 50 L) will be placed into clean food-grade polyethylene bags or HDPE buckets and sealed airtight for biological testing. Each container for biological testing will be clearly labeled with an indelible-ink pen. Table 8 presents the sediment sample processing and proposed testing strategy.

11.1.5 Sample Storage and Shipping

Samples will be temporarily stored in coolers supplied with crushed ice or frozen blue ice packs. Temperatures will be maintained at approximately 4 degrees Celsius (°C) plus or minus 2°C and monitored throughout storage. Archived core samples will be stored frozen at -20 degrees plus or minus 2°C for up to 1 year after sample collection.

Sediment will be shipped by overnight courier to the appropriate laboratories for analysis (see Table 1). Prior to shipping, samples will be securely packed inside a cooler with crushed ice or frozen blue ice packs. Proper COC procedures will be followed (Section 3.8.2). The original, signed COC forms will be placed into a sealed plastic bag and taped to the inside lid of the cooler. Packing tape will be wrapped completely around the cooler and a custody seal will be placed on the front lid seam. The laboratory project manager will ensure that COC forms are properly signed upon receipt of the samples and will note questions or observations concerning sample integrity on the COC forms. The laboratory will immediately contact QES's project manager if discrepancies between the COC forms and the sample shipment are discovered upon receipt. The laboratory sample custodian will measure and record the temperature of the temperature blank included in each cooler and will specifically note any coolers that do not contain ice packs or are not sufficiently cold upon receipt.

11.1.6 Field Equipment Decontamination Procedure and Waste Disposal

The deck of the vessel will be rinsed with site water between stations. Any sampling equipment that cannot be cleaned to the satisfaction of QES's field coordinator will not be used for any further sampling activity. All sampling equipment exposed to collected sediments will be decontaminated between stations using the following procedures:

- Rinse with site water and wash with scrub brush until free of sediment.
- Wash with phosphate-free biodegradable soap solution.
- Rinse with site water taken from below the water surface.

Acid or solvent washes will not be used in the field because of safety considerations and problems associated with rinsate disposal and sample integrity.

Any incidental sediment remaining after sampling will be washed overboard at the collection site, prior to moving to the next sampling location. Any sediment spilled on the deck of the sampling vessel will be washed into the surface waters at the collection site after sampling.

All disposable sampling materials and personnel protective equipment used in sample processing (such as disposable coveralls, gloves, and paper towels) will be placed into heavy-duty garbage bags or other appropriate containers. Disposable supplies will be removed from the vessel by sampling personnel and placed into a normal refuse container for disposal as solid waste.

11.2 Identify Support Facilities for Sampling Methods

Shallow Draft will provide the jack-up barge and all equipment necessary for the safe operation of the vessel, in support of sampling operations. The barge is 45 feet long and 18 feet wide. The vessel conforms to U.S. Coast Guard safety standards.

11.3 Describe Sampling Measurement System Failure Response and Corrective Action Process

If refusal is encountered during core sampling, the vessel will be moved and a second and third core attempted, if needed. If refusal is encountered after a third attempt, additional cores will not be attempted unless operational problems are suspected.

After the core is on deck, the liner containing sediment will be extracted onto a core tray and examined to determine compliance with acceptance criteria as follows:

- The core should penetrate and retain material to project depth plus 2 feet of overdredge depth (unless refusal was encountered).
- Cored material should not extend out the top of the core tube nor contact any part of the sampling apparatus at the top of the core tube.
- No obstructions should be present in the cored material that might have blocked the subsequent entry of sediment into the core tube and resulted in incomplete core collection.

If core acceptance criteria are not achieved, the core will be rejected, the old liner will be cleaned or replaced, and the procedure will be repeated until acceptance criteria are met. If three repeated deployments within a 50-foot radius of the proposed location do not yield a core that meets the appropriate acceptance criteria, the project manager may select an alternate location within the same DU.

11.4 Describe Sampling Equipment, Sample Preservation, and Holding Times

Sediment will be collected using a drilling rig secured to an 18 by 25 foot jack-up mounted geotechnical boring platform. The drilling rig will consist of a dual tube soil/sediment sampling system. An outer casing will house an inner rod with either a 1.125 or 1.85-inch inner diameter acrylic liner and a catcher to retain the sediment. The outer casing will be driven into the substrate; the inner rod will then be attached to a rod string and placed inside the outer casing. A hammer will be used to drive the assembly into the benthic floor until the inner rod is filled with sediment.

Site water will be collected using a peristaltic pump, or similar methods, and placed in low-density polyethylene (LDPE) cubitainers.

Samples for chemical analysis will be preserved and maintained according to the appropriate holding times listed in Tables 10 and 11. Samples for biological testing will be maintained at 4°C plus or minus 2°C. Sediment for biological testing should be used within 2 weeks of sampling, but no later than 8 weeks after sampling. Site water and control waters will be used within 2 weeks of collection. Elutriates will be used within 24 hours of preparation.

12.0 ELEMENT B3 – SAMPLE HANDLING AND CUSTODY REQUIREMENTS

Sample handling requirements for sediment and tissue samples are presented in Table 10. Sample handling requirements for Site water and elutriate samples are presented in Table 11.

COC procedures will be followed for all samples throughout the collection, handling, and analysis process. The COC forms will be the principal documents used to detail the possession and transfer of samples.

The field coordinator or a designee will be responsible for all sample tracking and COC procedures. This person will be responsible for final sample inventory, maintenance of sample custody documentation, and completion of COC and sample tracking forms prior to transferring samples to the laboratory. A COC form will accompany each cooler of samples to the analytical and biological laboratories. Each person who has custody of the samples will sign the COC form and ensure that the samples are not left unattended unless properly secured. Copies of all COC forms will be retained in the project files and will be attached to the final Sampling and Analysis Report (SAR).

The laboratory project manager will ensure that COC forms are properly signed upon receipt of the samples and will note questions or observations concerning sample integrity on the COC forms. The laboratory will contact the project manager or designee immediately if discrepancies between the COC forms and the sample shipment are discovered upon receipt.

13.0 ELEMENT B4 – ANALYTICAL METHODS REQUIREMENTS

13.1 Subsampling

Sediment core samples will be processed onboard the sampling vessel or landside. Physical characteristics of each core will be noted on the individual sediment core collection form (Appendix A). A representative core from each sampling location will be photographed. A 500 –milliliter (mL) aliquot of the bottom 2-feet of each core will be archived in the event additional chemistry testing is necessary to delineate the vertical migration of contaminants. Sediment from each core will then be individually homogenized to a uniform consistency in a stainless-steel bowl or high-density polyethylene (HDPE) bucket, whichever can accommodate the collected volume. This includes the entire length of the core. A 500-mL subsample of each individual homogenized core will be archived to allow for additional chemical analysis, if necessary. Archived core samples will be stored frozen at -20 degrees plus or minus 10 degrees Celsius (°C) for up to 1 year after sample collection.

A proportionate volume, based on relative core lengths, of the homogenized sediment from each core will be combined to form a single composite sample for the DU. Table 8 presents the sediment sample processing and proposed testing strategy. After completion of compositing, sediment will be placed into jars appropriate for physical and chemical analyses, and all jars will be firmly sealed with Teflon-lined lids. Waterproof sample labels will be filled out with an indelible-ink pen and affixed to the sample containers. Each label will contain the project name, sample identification, preservation technique, requested analyses, date and time of collection and preparation, and initials of the person preparing the sample. Remaining sediment (at least 50 L) will be placed into clean food-grade polyethylene bags or HDPE buckets and sealed airtight for biological testing. Each container for biological testing will be clearly labeled with an indelible-ink pen. Samples will be temporarily stored in coolers supplied with crushed ice or frozen blue ice packs. Temperatures will be maintained at approximately 4°C plus or minus 2°C and monitored throughout storage. Samples will be shipped according to the instructions in the following subsection.

13.2 Preparation of the Samples

Sediment will be shipped by overnight courier to the appropriate laboratories for analysis (see Table 1). Prior to shipping, samples will be securely packed inside a cooler with crushed ice or frozen blue ice packs. Proper COC procedures will be followed (Section 3.8.2). The original, signed COC forms will be placed into a sealed plastic bag and taped to the inside lid of the cooler. Packing tape will be wrapped completely around the cooler and a custody seal will be placed on the front lid seam. The laboratory project manager will ensure that COC forms are properly signed upon receipt of the samples and will note questions or observations concerning sample integrity on the COC forms. The laboratory will immediately contact QES's project manager if discrepancies between the COC forms and the sample shipment are discovered upon receipt. The laboratory sample custodian will measure and record the temperature of the temperature blank included in each cooler and will specifically note any coolers that do not contain ice packs or are not sufficiently cold upon receipt.

13.2.1 Site Water and Elutriate

Elutriate chemical analyses will be performed to demonstrate compliance with USEPA Water Quality Criteria (WQC) upon placement of dredged material. Sediment elutriates from each DU will be prepared for analysis in accordance with OTM procedures (USEPA/USACE 1991). One part sediment will be combined with four parts site water and vigorously mixed at room temperature for 30 minutes. After 30 minutes, the mixture will be allowed to settle for 1 hour. After this settling period, the liquid and suspended material will be siphoned off with care, not to disturb the sediment. The resulting elutriate will be centrifuged to remove particulates prior to analysis. In addition, chemical analysis of the site water, used to prepare elutriates, will be performed. Placement site water will not be analyzed as part of this testing program (for use in the mixing model), because existing data are available (CH2M HILL 2005). Chemical analyses will include ammonia, cyanide, metals, pesticides, pentachlorophenol, and tributyltin (TBT). Analytes selected for this evaluation are consistent with those recommended in the SERIM (USEPA Region IV/USACE SAD 2008). All analytical methods used will follow USEPA protocols. Table 12 presents the proposed chemical analytes, recommended analytical methods, and target detection limits for the evaluation of site water and elutriate samples. Samples will be maintained according to the appropriate holding times and temperatures for each analysis, as presented in Table 11.

13.2.2 Waste Characterization for Upland Disposal

If proposed dredged material from any of the DUs is determined to be not suitable for ocean disposal, and a suitable BU alternative is not available, TCLP testing may be conducted on that DU to evaluate suitability for upland placement. TCLP testing will follow SW-846 test method 1311, which involves tumbling a specified volume of sediment in a buffered extraction fluid to generate a simulated leachate (USEPA 1992), which will provide an estimate of the sediment contaminant leachate to determine if this material is suitable for upland placement under the Federal Resource Conservation and Recovery Act (RCRA). Leachate metals will be tested in this program and compared to USEPA Title 40 Code of Federal Regulation (CFR) Part 261 values (USEPA 2010). Table 13 provides the analyte list, methods, and reporting limits for TCLP chemistry. Additionally, pH will be measured to analyze samples for the RCRA characteristic of corrosively and TPH will be measured in bulk sediment and compared to landfill specific criteria.

Sediment contaminant concentrations can be used to determine if TCLP is needed. Sediment contaminant concentrations will be compared to 20 times the TCLP regulatory values. This factor is based on the liquid-to-solid ratio of 20:1 used in TCLP. For analytes with concentrations that exceed this criterion, TCLP testing will be performed.

13.3 Analytical Methods

13.3.1 Physical and Chemical Analysis

Physical and chemical analyses of sediment in this testing program were selected to determine suitability of dredged material for ocean placement based. Physical analyses of sediment will include grain size, total organic carbon (TOC), total solids, specific gravity, and pH. Historical data suggest that sediment from the turning basin will consist of a high percentage of sand, and clumping is not expected during placement activities; therefore, Atterberg limits are not recommended. Chemical analyses of sediment will include metals, PAHs, PCBs, pesticides, organotins, and total petroleum hydrocarbons (TPH). Following BP testing (see Section 5.3), tissue samples of surviving organisms will be transferred to the appropriate laboratory for analysis of potential contaminants. Tissue samples will be analyzed for a subset of these chemicals, based on sediment chemistry results and after review and discussion with USACE SAD and USEPA Region IV. Analytes selected for this

evaluation are consistent with those recommended for assessing dredged material in the southeastern United States (USEPA Region IV/USACE SAD 2008). These analytes were chosen based on toxicity, persistence in the environment, bioaccumulation potential, and widespread occurrence. Based on historical data, dioxins and dioxin-like compounds are not a contaminant of concern for this site and not recommended for this testing program. In 2004, sediment concentrations were comparable to the reference site and tissue concentrations were non-detect (EA 2006). All analytical methods used will follow USEPA or American Society for Testing and Materials (ASTM) protocols. Table 6 presents the proposed chemical and conventional analytes, recommended analytical methods, and target detection limits for the evaluation of sediment and tissue samples. Samples will be maintained according to the appropriate holding times and temperatures for each analysis, as presented in Table 7.

13.3.2 Biological Analysis

Biological testing will be conducted to determine suitability for ocean placement at one of the three nearby USEPA-designated ODMDS: Gulfport Eastern or Western, or Pascagoula. SP, SPP, and BP tests will be conducted to determine whether anthropogenic contaminants of concern are present at concentrations, such that ocean placement of the dredged material would pose an unacceptable risk of toxicity or bioaccumulation to biota. Evaluation of material will follow methods described in the OTM (USEPA/USACE 1991) and the SERIM (USEPA Region IV/USACE SAD 2008) for characterization relative to open-ocean placement requirements. Ten composite samples will be tested, representing dredged material from each DU (Figure 3). Reference material from reference sites will be tested, when appropriate (i.e., SP and BP tests). In addition, appropriate control samples will be tested for each species to evaluate test acceptability. Biological testing for this project will include two SP tests, three SPP tests, and two BP tests, as specified in Table 14.

13.3.2.1 Solid Phase Testing – Benthic Toxicity

SP tests will be conducted to evaluate the potential adverse toxicological impacts of dredged material on the benthic community after placement at the ocean placement site. These benthic tests involve exposing organisms to test sediments and comparing organism responses with those exposed to reference sediments. The two species proposed for SP

testing for this project include the amphipod *L. plumulosus* and the polychaete *N. arenaceodentata*. SP tests will be performed on project sediment, reference sediment, and control sediment. Project sediment refers to sediment collected from within the proposed dredge area. This includes the ten composite samples which represent each DU down to a depth of -40 feet MLLW (project depth plus overdepth). Prior to testing, all sediments will be sieved to remove indigenous organisms.

Amphipod Mortality Bioassay. The first benthic test species used in SP testing will be *L. plumulosus*. Criteria for test conditions and acceptability for this test can be found in Appendix L of the SERIM (USEPA Region IV/USACE SAD 2008). Control sediment will be provided from the organism supplier. Amphipods will be exposed to sediments for 10 days under static conditions with continuous light. Test temperature will be maintained at 25° plus or minus 1°C. Test chambers will be 1-liter (L) glass beakers or jars with approximately 200 mL of sediment and 700 mL of overlying seawater or artificial seawater prepared with Milli-Q® or equivalent and deionized water. There will be five replicates per treatment. At test initiation, 20 organisms will be placed into each replicate. Test chambers will be randomized and gently aerated during testing. Organisms will not be fed for the duration of the test. Water quality parameters will be measured daily during testing. After 10 days, organisms will be sieved from the sediment and survivorship will be recorded. Test acceptability will be evaluated by survivorship in the control, which should be at least 90%. In addition, the test must meet requirements listed in Table 11.3 of *Methods for Assessing the Toxicity of Sediment-associated Contaminants with Estuarine and Marine Amphipods* (USEPA 1994). If the test does not meet control acceptability criteria, it will be repeated. Minimum survival in the reference sediment must be at least 73%. If survival does not meet this criterion, test results will be compared to the control to provide a conservative level of protection. The relative sensitivity of each batch of amphipods will be assessed by conducting a 96-hour water-only reference toxicant test.

Ammonia is not considered a contaminant of concern in marine and estuarine sediments but can accumulate in subsurface sediments as a consequence of naturally occurring processes, such as bacterial degradation of organic matter. Because amphipods are sensitive to ammonia, even low levels of ammonia have the potential to confound toxicity test results by causing toxicity to test organisms. Consequently, interstitial ammonia concentrations will be

measured on project sediments prior to testing. If ammonia concentrations are elevated, it may be necessary to reduce ammonia concentrations prior to testing. For *L. plumulosus*, interstitial total and un-ionized ammonia concentrations must be less than 60 and 0.8 mg/L, respectively. If elevated, ammonia reduction procedures described in Appendix N of the SERIM (USEPA Region IV/USACE SAD 2008) will be followed. For each test with elevated ammonia, test sediments will be purged by manually exchanging the overlying seawater in each test chamber twice daily. Additional water quality replicates will be set up and used to monitor interstitial ammonia throughout the purging. Once all ammonia concentrations meet the criteria, test organisms will be placed into the test chambers, and the test will proceed as a static test, according to the procedures previously described. In accordance with Appendix N of the SERIM (USEPA Region IV/USACE SAD 2008), total ammonia concentrations should be reduced to 20 mg/L to ensure they remain within the required protocol range during testing.

Juvenile Polychaete Mortality Bioassay. The second benthic test species used in SP testing will be the polychaete *N. arenaceodentata*. Criteria for test conditions and acceptability for this test can be found in Appendix L of the SERIM (USEPA Region IV/USACE SAD 2008). Control sediment will be provided from the organism supplier. Polychaete tests will be conducted with 2- to 3-week-old organisms. Polychaetes will be exposed to sediments for 10 days under static conditions, with a 16-hour light/8-hour dark photoperiod. Test temperature will be maintained at 20° plus or minus 1°C. Test chambers will be 1-L glass beakers or jars with approximately 200 mL of sediment and 700 mL of overlying seawater or artificial seawater prepared with Milli-Q® or equivalent and deionized water. There will be five replicates per treatment. At test initiation, five to ten organisms will be placed into each replicate. Test vessels will be randomized and gently aerated during testing. Organisms will not be fed for the duration of the test. Water quality parameters will be measured daily during testing. After 10 days, organism will be sieved from the sediment and survivorship will be recorded. Test acceptability will be evaluated by survivorship in the control, which should be at least 90% (at least 80% in the individual replicates). If the test does not meet control acceptability criteria, it will be repeated. The relative sensitivity of each batch of polychaete will be assessed by conducting a 96-hour water-only reference toxicant test.

13.3.2.2 Suspended Particulate Phase Testing – Water Column Toxicity

SPP tests will be conducted to evaluate the potential adverse toxicological impacts of dredged material on organisms that live in the water column, after placement at the ocean placement site. The three species proposed for SPP testing for this project include the larvae of bivalve *Mytilus edulis*, the mysid shrimp *A.bahia*, and the inland silverside fish *M. beryllina*. SPP tests will be performed on sediment elutriates prepared from project sediments and not the reference sediment.

Sediment elutriates will be prepared for testing in accordance with OTM procedures (USEPA/USACE 1991). One part sediment will be combined with four parts site water and vigorously mixed at room temperature for 30 minutes. After 30 minutes, the mixture will be allowed to settle for 1 hour. After this settling period, the liquid and suspended material will be siphoned off with care not to disturb the sediment. The resulting supernatant is considered the 100% SPP. If the dredged material is extremely fine, it may be necessary to centrifuge the material prior to testing in order to observe test organisms in the chamber.

Larval Development Bioassay. Water-column tests will be performed using larvae of the bivalve *M. edulis*. Criteria for test conditions and acceptability can be found in Appendix L of the SERIM (USEPA Region IV/USACE 2008). Because of seasonality in gamete availability, one of the alternative bivalve or echinoderm species listed in Table 6-1 of the SERIM (USEPA Region IV/USACE SAD 2008) may be substituted for *M. edulis* if gravid mussels are unavailable. The bivalve water column toxicity test will be conducted with four concentrations of SPP (1%, 10%, 50%, and 100%), prepared with clean filtered seawater or artificial seawater prepared with Milli-Q® or equivalent and deionized water. In addition, a control and a Site water control will be tested. There will be five replicates per concentration. Each replicate will be inoculated with an equal amount of bivalve embryos (15 to 30 embryos/mL) and held for 48 hours at 16° plus or minus 1°C, with a 16-hour light/8-hour dark photoperiod. More time may be necessary to ensure satisfactory development of bivalve larvae to the prodissoconch I stage (D-hinge stage) in the seawater control. Water quality parameters will be measured daily during testing on an additional water quality replicate. At test termination, chambers will be preserved and the number of normally developed larvae will be determined using a microscope. Test acceptability criteria for this test are at least 90% survival and 70% normal shell development in the control. The

relative sensitivity of each batch of bivalve will be assessed by conducting a reference toxicant test.

Mysid Shrimp Bioassay. Water column tests will be performed using the mysid shrimp *A. bahia*. Criteria for test conditions and acceptability for this crustacean can be found in Appendix L of the SERIM (USEPA Region IV/USACE SAD 2008). The water column toxicity test will be conducted with three concentrations of SPP (10%, 50%, and 100%), prepared with clean filtered seawater or artificial seawater prepared with Milli-Q® or equivalent and deionized water. In addition, a control and a site water control will be tested. There will be five replicates per concentration with ten mysid shrimp each. Organisms will be exposed to SPP for 96 hours under static–renewal conditions with a 16-hour light/8-hour dark photoperiod. Test temperature will be maintained at 20° or 25° plus or minus 1°C. Organisms will be fed *Artemia nauplii* daily. Water quality parameters will be measured daily during testing. Test acceptability will be evaluated by survivorship in the control, which should be at least 90%. If the test does not meet control acceptability criteria, it will be repeated. The relative sensitivity of each batch of mysid shrimp will be assessed by conducting a 96-hour reference toxicant test.

Juvenile Fish Bioassay. Water column tests will be performed using the inland silverside fish *M. beryllina*. Criteria for test conditions and acceptability for this crustacean can be found in Appendix L of the SERIM (USEPA Region IV/USACE SAD 2008). The water column toxicity test will be conducted with three concentrations of SPP (10%, 50%, and 100%), prepared with clean, filtered seawater or artificial seawater prepared with Milli-Q® or equivalent and deionized water. In addition, a control and a site water control will be tested. There will be five replicates per concentration with ten fish each. Organisms will be exposed to SPP for 96 hours under static conditions, with a 16-hour light/8-hour dark photoperiod. Test temperature will be maintained at 20° or 25° plus or minus 1°C. Organisms will be fed *A. nauplii* at 48 hours. Water quality parameters will be measured daily during testing. Test acceptability will be evaluated by survivorship in the control, which should be at least 90%. If the test does not meet control acceptability criteria, it will be repeated. The relative sensitivity of each batch of fish will be assessed by conducting a 96-hour reference toxicant test.

13.3.2.3 Bioaccumulation Potential Testing

Bioaccumulation tests are designed to evaluate the potential of benthic organisms to accumulate contaminants from the sediment. The two species proposed for BP testing for this project include the bivalve *M. nasuta* and the polychaete *N. virens*. BP tests will be performed on project sediment, reference sediment, and control sediment. Prior to testing, a subset of organisms will be depurated and frozen for determination of time zero (T0) tissue concentrations.

Bivalve Bioaccumulation Test. The first bioaccumulation test species will be the bivalve *M. nasuta.* Criteria for test conditions and acceptability for this test can be found in Appendix L of the SERIM (USEPA Region IV/USACE SAD 2008). Organisms will be exposed to sediments for 28 days under flow-through or static renewal conditions. Test temperature will be maintained at 12° to 16° plus or minus 1°C. There will be five replicates per treatment. Test chambers will be randomized and gently aerated. At test initiation, at least 20 organisms will be placed into each replicate, although more may be necessary to obtain sufficient tissue for chemical analysis. Organisms will not be fed for the duration of the test. Water quality parameters will be measured daily during testing. After 28 days, organisms will be sieved from the sediment and survivorship will be recorded. Test acceptability will be evaluated by survivorship, which should be at least 90% in the control and reference, and 75% in test treatments. If the test does not meet control acceptability criteria, USACE SAD district and USEPA Region IV will be notified immediately. Surviving bivalve will be rinsed with clean seawater and depurated. After 24 hours, organisms will be placed into appropriately sized pre-cleaned sample containers and immediately frozen. The frozen organisms will be shipped on dry ice to the appropriate laboratory for analysis of potential contaminants. Methods for chemical analysis of tissue samples are presented in Section 4.1.

Polychaete Bioaccumulation Test. The second bioaccumulation test species will be the polychaete *N. virens.* Criteria for test conditions and acceptability for this test can be found in Appendix L of the SERIM (USEPA Region IV/USACE SAD 2008). Organisms will be exposed to sediments for 28 days under flow-through or static renewal conditions. Test temperature will be maintained at 10° plus or minus 5°C. There will be five replicates per treatment. Test chambers will be randomized and gently aerated. At test initiation, at least 20 organisms will be placed into each replicate, although more may be necessary to obtain

sufficient tissue for chemical analysis. Organisms will not be fed for the duration of the test. Water quality parameters will be measured daily during testing. After 28 days, organisms will be sieved from the sediment and survivorship will be recorded. Test acceptability will be evaluated by survivorship, which should be at least 90% in the control and reference, and 75% in test treatments. If the test does not meet control acceptability criteria, USACE SAD district and USEPA Region IV will be notified immediately. Surviving polychaete will be rinsed with clean seawater and depurated. After 24 hours, organisms will be placed into appropriately sized pre-cleaned sample containers and immediately frozen. The frozen organisms will be shipped on dry ice to the appropriate laboratory for analysis of potential contaminants. Methods for chemical analysis of tissue samples are presented in Section 4.1.

14.0 ELEMENT B5 – QUALITY CONTROL REQUIREMENTS

Laboratory QC objectives are presented in Table 4. The frequency of analysis for laboratory QA/QC samples are summarized in Table 5. QC summary tables are also presented in Appendix O of the SERIM (USEPA Region IV/USACE SAD 2008). When analyzing chemical parameters, USEPA methods require that initial calibrations must be completed before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet acceptance criteria. Ongoing calibrations are required at the frequencies listed in Table 5. Surrogates are required for all organic methods. Additional QA/QC samples include laboratory replicates, matrix spike samples, method blanks, laboratory control samples (LCSs), and standard reference materials (SRMs).

All samples will be diluted and re-analyzed if target compounds are detected at levels that exceed their respective established calibration ranges. Any sample cleanup procedure will be conducted prior to the dilutions. If surrogate, internal standard, or spike recoveries are outside of the laboratory QC limits, reanalysis will be performed. QC samples may be reanalyzed if results are not within control limits and the cause cannot be determined to be the sample matrix.

14.1 Test Quality Control

All biological tests will incorporate standard QA/QC procedures, per the OTM (USEPA/USACE 1991) and ITM (USEPA/USACE 1998), to ensure that the test results are valid. Standard QA/QC procedures include the use of negative controls, positive controls, reference sediment samples, replicates, and measurements of water quality during testing.

The negative control is used to establish the health of the test organisms and ensure acceptability criteria are met. For SP and BP testing, control material will consist of clean sediment. For SPP testing, control material will consist of filtered seawater or artificial seawater prepared with Milli-Q® or equivalent and deionized water. Positive controls (i.e., reference toxicant tests) will be used to establish the sensitivity of test organisms. The reference toxicant test median lethal concentration (LC_{50}) or median effective concentration (EC_{50}) should fall within two standard deviations of the historical mean, indicating sensitivity is normal.

Proper water quality conditions will be maintained for all tests to ensure that organisms survive and do not experience undue stress unrelated to test sediments. If water quality measurements fall outside of the protocol ranges, corrective action will be taken. Laboratory equipment will be maintained, and all instruments will be calibrated regularly. All laboratory work will be documented on approved datasheets.

15.0 ELEMENT B6 – INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

In accordance with the QA program, the laboratory shall maintain an inventory of instruments and equipment and the frequency of maintenance will be based on the manufacturer's recommendations and/or previous experience with the equipment.

The laboratory preventative maintenance program, as detailed in their QA Plan, is organized to maintain proper instrument and equipment performance and to prevent instrument and equipment failure during use. The program considers instrumentation, equipment, and parts that are subject to wear, deterioration, or other changes in operational characteristics; the availability of spare parts; and the frequency at which maintenance is required. Any equipment that has been overloaded, mishandled, gives suspect results, or has been determined to be defective will be taken out of service, tagged with the discrepancy noted, and stored in a designated area until the equipment has been repaired. After repair, the equipment will be tested to ensure that it is in proper operational condition. Anchor QEA will be promptly notified in writing if defective equipment casts doubt on the validity of analytical data. Anchor QEA will also be notified immediately regarding any delays due to instrument malfunctions that could impact holding times.

The analytical laboratory will be responsible for the preparation, documentation, and implementation of the preventative maintenance program. All maintenance records will be checked according to the schedule on an annual basis and recorded by the responsible individual. The laboratory QA/QC manager, or designee, shall be responsible for verifying compliance.

16.0 ELEMENT B7 – INSTRUMENT CALIBRATION AND FREQUENCY

Proper calibration of equipment and instrumentation is an integral part of the process that provides quality data. Instrumentation and equipment used to generate data must be calibrated at a frequency that ensures sufficient and consistent accuracy and reproducibility. As part of their QC program, laboratories perform two types of calibrations. A periodic calibration is performed at prescribed intervals (i.e., balances, drying ovens, refrigerators, and thermometers), and operational calibrations are performed daily, at a specified frequency, or prior to analysis (i.e., initial calibrations) according to method requirements. Calibration procedures and frequency are discussed in the laboratory's QA Plan. Calibrations are discussed in the laboratory SOPs for analyses.

The laboratory QA/QC manager will be responsible for ensuring that laboratory instrumentation is calibrated in accordance with specifications. Implementation of the calibration program shall be the responsibility of the respective laboratory Group Supervisors. Recognized procedures (USEPA, ASTM, or manufacturer's instructions) shall be used when available.

Physical standards (i.e., weights or certified thermometers) shall be traceable to nationally recognized standards, such as the National Institute of Standards and Technology (NIST). Chemical reference standards shall be NIST Standard Reference Materials (SRMs) or vendor-certified materials traceable to these standards.

The calibration requirements for each method and respective corrective actions shall be accessible, either in the laboratory SOPs or the laboratory's QA Plan, for each instrument or analytical method in use. All calibrations shall be preserved on electronic media.

17.0 ELEMENT B8 – INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

All supplies and consumables used in the field to calibrate instruments or by the laboratories to calibrate instruments or as part of reference toxicant tests will be inspected and logged.

Sample containers will be certified as clean and their Certificate of Analysis will be retained by the Project Manager or the analytical laboratories.

The lot numbers and expiration dates of calibration standards used for field instruments will be recorded on the calibration sheets to ensure that they have not expired.

All laboratory consumables and supplies such as calibration standards, reagent-grade water, reference toxicants, organisms for testing, and sample containers, will be inspected and documented in accordance with NELAC or other accreditation requirements and with each laboratory's SOPs or QA Plan.

18.0 ELEMENT B9 – DATA ACQUISITION REQUIREMENTS (NON-DIRECT MEASUREMENTS)

As part of this sampling and analysis program, a variety of data types will be collected including: field data, analytical chemistry, toxicity test data, GIS data and maps, etc. These data will all be retained by the contractor and submitted as part of the Sediment Test Report, in accordance with the SAP/QAPP or upon request by USACE or USEPA.

19.0 ELEMENT B10 – DATA MANAGEMENT, INTERPRETATION, AND REDUCTION

19.1 Data Management

Analytical data records will be retained by the laboratory and in the project files. Laboratory analytical reports will be provided to Anchor QEA in electronic format, including a report in a PDF format and the Electronic Data Deliverable (EDD). The EDD should be provided in the EQuIS electronic format for importation into Anchor QEA's database system. The laboratory data that are provided electronically and loaded into the database will undergo a 10% check against the laboratory hard copy data. Data will be validated or reviewed manually, and qualifiers, if assigned, will be entered manually. The accuracy of all manually entered data will be verified by a second party. Data tables and reports will be exported from EQuIS to MS Excel tables.

19.2 Data Analysis and Interpretation

Data will be analyzed and presented clearly, so that suitability of dredged material for placement can be determined. All analytical data will be reviewed for accuracy prior to reporting.

19.2.1 Sediment Chemistry and Conventional Data Analyses

Sediment physical and chemical characteristics provide information about chemicals of concern present in sediment and, when compared to existing literature, can indicate their potential bioavailability. Sediment physical and chemical characteristics also provide information about non-chemical factors that could affect toxicity or bioaccumulation. Data analysis of sediment chemistry and physical parameters will consist of tabulation and comparison with existing regulatory guidelines, including screening level values such as the TEL and probable effects level (PEL; MacDonald et al. 1996) or the ER-L and effects range – median (ER-M; Long et al. 1995). While these values are useful for identifying elevated sediment-associated contaminants, they should not be used to infer causality because of the inherent variability and uncertainty of the approach. Sediment chemistry results will also be used in conjunction with bioassay and biological test results to assist in evaluating appropriate placement options. If necessary, TCLP chemistry results will be compared to

USEPA Title 40 CFR Part 261 values (USEPA 2010) to determine suitability for upland placement.

19.2.2 Site Water and Elutriate Chemistry Data Analyses

Water and elutriate chemical characteristics provide information about the chemicals of concern that may be potentially released into the water column during the placement operation. Data analysis of site water and elutriate chemistry will consist of tabulation and comparison with existing regulatory guidelines, such as the USEPA WQC and State water quality standards (WQS). Appendix F of the SERIM (USEPA Region IV/USACE SAD 2008) presents an example of the USEPA WQC; the latest USEPA WQC will be consulted for compliance comparison. If any of the analytical results exceed the WQC, STFATE modeling will be conducted to determine if compliance will be met within the site boundaries after 4 hours of mixing.

19.2.3 Toxicity Data Analysis

Biological testing results provide information about the potential ecological effects of placing dredged material at an unconfined aquatic placement site (such as the Gulfport Eastern or Western ODMDS, or Pascagoula ODMDS). The results of the SP toxicity test treatments will be compared with the concurrently tested reference treatment. The results of the SPP toxicity test treatments will be compared to the control and, if necessary, used in a numerical mixing model.

19.2.3.1 Solid Phase – Benthic Toxicity Test Data

ITM guidance (USACE/USEPA 1998) requires that test sediment results be compared with reference sediment results to determine the potential impact of whole sediment on benthic organisms at and beyond the boundaries of the placement site. The comparative guidelines for acceptance are as follows:

- If survival in test sediment is greater than survival in reference sediment ($S_T > S_R$), test sediments are not acutely toxic to benthic organisms.
- If the difference between survival in reference sediment and survival in test sediment is not more than 20% ($S_R - S_T \leq 20\%$) for amphipods and not more than 10% ($S_R - S_T \leq$

10%) for other test species, test sediments are not acutely toxic to benthic organisms.

- If the difference between survival in reference sediment and survival in test sediment is greater than 20% ($S_R - S_T > 20\%$) for amphipods and 10% ($S_R - S_T > 10\%$) for other test species, then survival in the test sediment must be compared statistically to survival in the reference sediment. If a significant difference is found, then the test sediments are considered to be acutely toxic to benthic organisms and do not meet the LPC requirements for ocean placement.

19.2.3.2 Suspended Particulate Phase – Water Column Toxicity Test Data

ITM guidance (USACE/USEPA 1998) requires that test results be compared with laboratory control results to determine the potential impact of sediment elutriates on water column organisms within the mixing zone during placement activities. Comparative guidelines for acceptance are as follows:

- If survival in the 100% SPP prepared from test sediment is equal to or greater than survival in the control or the natural seawater dilution ($S_T \geq S_C$ or S_D), the dredged material is not predicted to be acutely toxic to water column organisms.
- If survival in the 100% SPP prepared from test sediment is no more than 10% less than survival in the natural seawater dilution ($S_D - S_T \leq 10\%$), there is no need for statistical analyses and no indication of water column toxicity attributable to the test sediments.
- If the difference in survival between the 100% SPP prepared from test sediment and the natural seawater dilution is greater than 10% ($S_D - S_T \geq 10\%$), then data must be evaluated statistically to determine toxicity. A LC_{50} or EC_{50} should be calculated; however, if there is no effect greater than 50%, the LC_{50} or EC_{50} is assumed to be greater than or equal to 100%. If LC_{50} or EC_{50} values are calculated, ITM guidelines specify conducting a comparison with water quality standards. A dilution model (i.e., STFATE) will be used to determine the concentration of dissolved plus suspended contaminants, after allowance of mixing. The guidelines stipulate that water column concentrations must not exceed 1% of the LC_{50} or EC_{50} outside the mixing zone.

19.2.4 Bioaccumulation Data

Bioaccumulation results will be steady-state adjusted and evaluated in accordance with guidelines described in the OTM (USEPA/USACE 1991) and ITM (USEPA/USACE 1998). The initial comparison, if applicable, will be against applicable FDA action levels for poisonous or deleterious substances in fish and shellfish for human food, when such levels have been set for the bioaccumulative contaminants of concern.

In the absence of action levels, or if tissue contaminant concentrations are statistically less than action levels, results will be compared to tissue concentrations of organisms exposed to reference sediment. If tissue concentrations of organisms exposed to test sediment do not statistically exceed those of organisms exposed to reference sediment, the dredged material meets the LPC requirements for bioaccumulation and may be suitable for open-ocean placement. If tissue concentrations of organisms exposed to test sediment are statistically elevated compared to the organisms exposed to reference sediment, results will first be compared to bioaccumulation screening levels developed by USEPA Region IV (USEPA Region IV/USACE SAD 2008). Contaminant concentrations that exceed these bioaccumulation screening levels will be further assessed based on the criteria specified in the OTM (e.g., toxicological importance of contaminants, magnitude of exceedance, propensity to biomagnify; USEPA/USACE 1991) to determine compliance with the LPC. This assessment will include a comparison to residue-effects values provided in the USACE/USEPA Environmental Residue-Effects Database (ERED; USACE/USEPA 2009).

19.3 Data Reduction

Data reduction is the process by which original data (analytical measurements) are converted or reduced to a specified format or unit to facilitate analysis of the data. Data reduction requires that all aspects of sample preparation that could affect the test result, such as sample volume analyzed or dilutions required, be taken into account in the final result. It is the laboratory analyst's responsibility to reduce the data, which are subjected to further review by the laboratory manager, the project manager, the QA/QC manager, and independent reviewers. Data reduction may be performed manually or electronically. If performed electronically, all software used must be demonstrated to be true and free from unacceptable error.

20.0 ELEMENT C1 – ASSESSMENTS AND RESPONSE ACTIONS

Once data are received from the laboratory, a number of QC procedures will be followed to provide an accurate evaluation of data quality. Specific procedures will be followed to assess data precision, accuracy, and completeness. A USEPA Stage 2A data quality review will be performed in accordance with the National Functional Guidelines (USEPA 1999, 2004, 2008) and this QAPP. All chemical data will be reviewed with regard to the following, as appropriate, to the particular analysis:

- COC documentation
- Holding times
- Method blanks
- Detection limits
- Reporting limits
- Surrogate recoveries
- Matrix spike/matrix spike duplicate recoveries
- Laboratory control sample recoveries
- Laboratory and field duplicate RPDs

The results of the data quality review, including text assigning qualifiers in accordance with the National Functional Guidelines (USEPA 1999, 2004, 2008) and a tabular summary of qualifiers, will be generated by the data manager and submitted to the project QA/QC manager for final review and confirmation of the validity of the data. A copy of the validation report will be submitted by the QA/QC manager and will be presented as an appendix to the final Sampling and Analysis Report (SAR).

20.1.1 Compliance Assessments

Laboratory and field performance audits consist of on-site reviews of QA systems and equipment for sampling, calibration, and measurement. Laboratory audits will not be conducted as part of this study; however, all laboratory audit reports will be made available to the project QA/QC manager upon request. The laboratory is required to have written procedures addressing internal QA/QC; these procedures have been submitted and will be reviewed by the project QA/QC manager to ensure compliance with the QAPP. The laboratory must ensure that personnel engaged in sampling and analysis tasks have

appropriate training. The laboratory will, as part of the audit process, provide for consultant's review written details of any and all method modifications planned.

20.1.2 Response and Corrective Actions

The following paragraphs identify the responsibilities of key project team members and actions to be taken in the event of an error, problem, or nonconformance to protocols identified in this document.

20.1.2.1 Field Activities

The FC will be responsible for correcting equipment malfunctions during the field sampling effort. The project QA/QC manager will be responsible for resolving situations identified by the FC that may result in noncompliance with this QAPP. All corrective measures will be immediately documented in the field logbook.

20.1.2.2 Laboratory

The laboratory is required to comply with their SOPs. The laboratory manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this QAPP. All laboratory personnel will be responsible for reporting problems that may compromise data quality

The laboratory manager will be notified immediately if any QC sample exceeds the project-specified control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. The laboratory manager will document in a memorandum the corrective action taken and submit that memorandum to the QA/QC manager within 5 days of the initial notification. A narrative describing the anomaly, the steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, and re-extraction) will be submitted with the data package in the form of a cover letter.

21.0 ELEMENT C2 – REPORTS TO MANAGEMENT

As indicated in Section 6.2.6, the following reports will be submitted:

1. Sampling and Analysis/draft Quality Assurance Project Plan (SAP/QAPP) submitted for review and comment.
2. Final Quality Assurance Project Plan (SAP/QAPP), after revisions based on comments for final approval prior to sampling.
3. Site-Specific Health and Safety Plan – Accident Prevention Plan.
4. Daily Field Reports. A daily field report will be prepared by the Field Team Coordinator or Project Manager after each day sampling is completed. This report describe the location(s) of sampling, samples collected, general field conditions, sampling plan divergences, and corrective actions, and will be an appendix to the Final Sediment Testing Report.
5. Chemical Quality Assurance Report (CQAR). The CQAR describes the overall quality and usability of the data as part of the project field sampling and laboratory analyses. The CQAR will be based on a data quality review of all daily field reports and results of external analytical data validation and will identify any issues or deficiencies that would impact the data quality objectives specified in the SAP/QAPP. This report will be an appendix to the Final Sediment Testing Report.
6. Preliminary Sediment Chemistry Data Report.

Final Sediment Evaluation Testing Report, after comments and associated revisions.

22.0 ELEMENT D1 – DATA REVIEW, VALIDATION, AND VERIFICATION REQUIREMENTS

During the validation process, analytical data will be evaluated for method and laboratory QC compliance, and their validity and applicability for program purposes will be determined. Based on the findings of the validation process, data validation qualifiers may be assigned. The validated project data, including qualifiers will be entered into the project database, thus enabling this information to be retained or retrieved, as needed.

23.0 ELEMENT D2 – VALIDATION AND VERIFICATIONS METHODS

Data validation includes signed entries by the field and laboratory technicians on field data sheets and laboratory data sheets, respectively; review for completeness and accuracy by the FC and laboratory manager; review by the data manager for outliers and omissions; and the use of QC criteria to accept or reject specific data. All data will be entered into the EQuIS database, and a raw data file will be generated. Ten percent verification of the database raw data file and one hundred percent verification of validation qualifiers applied will be performed by a second data manager or designee. Any errors found will be corrected on the raw data printout sheet. After the raw data is checked, the top sheet will be marked with the date the checking is completed and the initials of the person doing the checking. Any errors in the raw data file will be corrected, and the database will be established.

All laboratory data will be reviewed and verified to determine whether all DQOs have been met and that appropriate corrective actions have been taken, when necessary. The project QA/QC manager or designee will be responsible for the final review of all data generated from analyses of samples.

The first level of review will take place in the laboratory as the data are generated. The laboratory department manager or designee will be responsible for ensuring that the data generated meet minimum QA/QC requirements and that instruments were operating under acceptable conditions during generation of data. DQOs will also be assessed at this point by comparing the results of QC measurements with pre-established criteria as a measure of data acceptability.

The analysts and/or laboratory department manager will prepare a preliminary QC checklist for each parameter and for each sample delivery group (SDG) as soon as analysis of an SDG has been completed. Any deviations from the DQOs listed on the checklist will be brought to the attention of the laboratory manager to determine whether corrective action is needed and to determine the impact on the reporting schedule.

Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. Data quality

will be assessed by a reviewer using current National Functional Guidelines data validation requirements (USEPA 1999, 2004, 2008) by considering the following:

- Holding times
- Method blanks
- Surrogate recoveries
- Detection limits
- Reporting limits
- Laboratory control samples
- Matrix spike/matrix spike duplicate samples
- SRM results

Data will be validated in accordance with the project-specific DQOs previously described, analytical method criteria, and the laboratory's internal performance standards based on their SOPs.

24.0 ELEMENT D3 – RECONCILIATION WITH DATA QUALITY OBJECTIVES

The QA/QC manager will review data after each survey to determine if DQOs have been met. If data do not meet the project's specifications, the QA/QC manager will review the errors and determine if the problem is due to calibration/maintenance, sampling techniques, or other factors and will suggest corrective action. It is expected that any problem would be able to be corrected by retraining, revision of techniques, or replacement of supplies/equipment; if not, the DQOs will be reviewed for feasibility. If specific DQOs are not achievable, the QA/QC manager will recommend appropriate modifications. Any revisions will require approval by USACE.

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TABLES

Table 1

Analytical Laboratories, Points of Contact, and Shipping Information

Laboratory	Volume per Sample (minimum requirement)	Analyses Performed	Point of Contact	Shipping Information
Test America	4 L	Sediment Chemistry and Physical Testing	Suzy Lindblom	900 Lakeside Drive Mobile, Alabama 36695 (251) 666-6633
Test America	50 L	Bioassay and Bioaccumulation Testing	Suzy Lindblom	900 Lakeside Drive Mobile, Alabama 36695 (251) 666-6633

Notes:

L - liters

Table 2

Approximate Construction Dredging Volumes, by Dredge Unit, From Within the Proposed Gulfport Turning Basin

DU	Project Depth		2-Foot Overdredge Depth Volume (CY)	Total Volume (CY)
	Design Depth Cut Volume (CY)	2-Foot Advanced Maintenance Volume (CY)		
GP-DU1	268,532	58,551	58,551	385,634
GP-DU2	256,974	32,206	32,206	321,387
GP-DU3	307,617	34,466	34,466	376,549
GP-DU4	278,031	26,359	26,359	330,750
GP-DU5	322,799	28,848	28,848	380,496
GP-DU6	267,050	24,612	24,612	316,274
GP-DU7	307,875	27,029	27,029	361,932
GP-DU8	297,131	27,222	27,222	351,575
GP-DU9	251,972	23,028	23,028	298,028
GP-DU10	289,675	29,704	29,704	349,082
Total	**2,847,656**	**312,025**	**312,025**	**3,471,707**

Table 3

Summary of Physical, Chemical, and Biological Measurements During Sampling Program

Sediment
Physical Analysis
Total solids
Grain size
Specific gravity
Chemical Analysis
pH
Total petroleum hydrocarbons
Total organic carbon (TOC)
Metals
Polycyclic aromatic hydrocarbons (PAHs)
Pentachlorophenol
Organotins
Polychlorinated biphenyl (PCB) congeners
Pesticides
Biological Testing
Solid phase tests using amphipod and polychaete
Suspended particulate phase tests using bivalve larvae, mysid shrimp, and fish
Bioaccumulation tests using bivalve and polychaete
Site Water and Elutriate
Chemical Analysis
Ammonia
Cyanide
Tribytyltin
Metals
Pentachlorophenol
Pesticides
Tissue
Chemical Analysis
Lipids and a subset of chemicals based on sediment chemistry results and discussion with USACE SAD and USEPA Region IVs

Table 4

Laboratory Quality Control Objectives

Parameter	Precision (duplicates)	Laboratory Control Spike Recoveries	Matrix Spike Recoveries	Completeness
Grain Size	+/- 20% RPD	N/A	N/A	90%
Specific Gravity and pH	+/- 20% RPD	N/A	N/A	90%
Total Solids	+/- 20% RPD	N/A	N/A	90%
Lipids	+/- 20% RPD	N/A	N/A	90%
TOC	+/- 20% RPD	75-125% R	75-125% R	90%
Metals	+/- 30% RPD	70-130% R	70-130% R	90%
PAHs	+/- 30% RPD	50-150% R	50-150% R	90%
Organotins	+/- 35% RPD	50-150% R	50-150% R	90%
PCBs	+/- 30% RPD	50-150% R	50-150% R	90%
Pesticides and TPH	+/- 35% RPD	50-150% R	50-150% R	90%

Notes:

R - recovery
RPD - relative percent difference
TOC - total organic carbon

Table 5
Laboratory Quality Control Sample Analysis Frequency

Analysis Type	Initial Calibration	Ongoing Calibration	LCS/SRM[2]	Replicates	Matrix Spikes	Matrix Spike Duplicates	Method Blanks	Surrogate Spikes
Ammonia	Each batch	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	1 per 20 samples	N/A
Cyanide	Each batch	N/A	1 per 20 samples	N/A	N/A	N/A	1 per 20 samples	N/A
Grain size/Specific Gravity/pH	Each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A
Total olids	Each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A
Lipids	Each batch	N/A	N/A	1 per 20 samples	N/A	N/A	N/A	N/A
TOC	Daily	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	1 per 20 samples	N/A
Metals	Daily	1 per 10 samples	1 per 20 samples	1 per 20 samples	1 per 20 samples	N/A	1 per 20 samples	N/A
PAHs	As needed[1]	Every 12 hours	1 per 20 samples	N/A	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
Organotins	As needed[1]	Every 12 hours	1 per 20 samples	N/A	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample
Pesticides/PCBs/TPH	As needed[1]	1 per 10 samples	1 per 20 samples	N/A	1 per 20 samples	1 per 20 samples	1 per 20 samples	Every sample

Notes:

1. Initial calibrations are considered valid until the continuing calibration no longer meets method specifications. At that point, a new initial calibration is performed.
2. When a SRM is available, it may be used in lieu of an LCS.

Table 6

Sediment Core and Composite Sample Identifications

DU	Individual Core Station ID (archived)	Composite Sample ID (analyzed)	Estimated Dredge Volume Including 2-foot Overdredge (CY)
GP-DU1	GP-DU1-01 GP-DU1-02 GP-DU1-03	GP-DU1-COMP	385,634
GP-DU2	GP-DU2-01 GP-DU2-02 GP-DU2-03	GP-DU2-COMP	321,387
GP-DU3	GP-DU3-01 GP-DU3-02 GP-DU3-03	GP-DU3-COMP	376,549
GP-DU4	GP-DU4-01 GP-DU4-02 GP-DU4-03	GP-DU4-COMP	330,750
GP-DU5	GP-DU5-01 GP-DU5-02 GP-DU5-03	GP-DU5-COMP	380,496
GP-DU6	GP-DU6-01 GP-DU6-02 GP-DU6-03	GP-DU6-COMP	316,274
GP-DU7	GP-DU7-01 GP-DU7-02 GP-DU7-03	GP-DU7-COMP	361,932
GP-DU8	GP-DU8-01 GP-DU8-02 GP-DU8-03	GP-DU8-COMP	351,575
GP-DU9	GP-DU9-01 GP-DU9-02 GP-DU9-03	GP-DU9-COMP	298,028
GP-DU10	GP-DU10-01 GP-DU10-02 GP-DU10-03	GP-DU10-COMP	349,082
Total Samples	**30**	**10**	**3,471,707**

Table 7

Target Coordinates, Estimated Mudline Elevations, and Target Core Lengths for Proposed Sampling Locations

Station ID	Easting (ft)	Northing (ft)	Estimated Mudline Elevation (feet MLLW)	Target Core Length (ft)	Project Depth Plus Overdepth (feet MLLW)
GP-DU1-01	904525.0	308692.4	-27.3	12.7	-40
GP-DU1-02	905398.9	308668.4	-27.0	13.0	-40
GP-DU1-03	904846.9	308200.7	-20.8	19.2	-40
GP-DU2-01	905465.5	308322.4	-23.4	16.6	-40
GP-DU2-02	905904.8	308252.2	-21.7	18.3	-40
GP-DU2-03	905698.4	308002.6	-15.0	25.0	-40
GP-DU3-01	905111.5	307690.7	-13.1	26.9	-40
GP-DU3-02	905264.8	308132.2	-20.9	19.1	-40
GP-DU3-03	905521.3	307811.0	-15.0	25.0	-40
GP-DU4-01	906048.6	307547.8	-12.0	28.0	-40
GP-DU4-02	905968.9	307848.4	-13.0	27.0	-40
GP-DU4-03	906253.8	307748.1	-14.7	25.3	-40
GP-DU5-01	905352.9	307394.4	-13.1	26.9	-40
GP-DU5-02	905686.3	307298.4	-12.0	28.0	-40
GP-DU5-03	905719.5	307592.4	-12.4	27.6	-40
GP-DU6-01	906244.7	307410.7	-12.0	28.0	-40
GP-DU6-02	906293.3	307052.3	-13.2	26.8	-40
GP-DU6-03	906535.3	307379.7	-14.3	25.7	-40
GP-DU7-01	905717.5	306963.9	-12.0	28.0	-40
GP-DU7-02	905988.1	306873.7	-12.0	28.0	-40
GP-DU7-03	906031.3	307179.1	-12.0	28.0	-40
GP-DU8-01	906464.8	306882.4	-12.0	28.0	-40
GP-DU8-02	906820.5	306693.8	-12.6	27.4	-40
GP-DU8-03	906733.6	307034.9	-13.9	26.1	-40
GP-DU9-01	905988.6	306544.5	-12.0	28.0	-40
GP-DU9-02	906380.6	306525.8	-12.0	28.0	-40
GP-DU9-03	906303.3	306764.9	-12.0	28.0	-40
GP-DU10-01	906866.2	306464.1	-10.8	29.2	-40
GP-DU10-02	907071.6	306597.6	-13.4	26.6	-40
GP-DU10-03	907292.4	306320.8	-19.5	20.5	-40

Table 8

Sediment Sample Processing and Testing Strategy

Composite Sample	Core ID	Archive	Sediment Chemistry	Tier III Biological Testing
GP-DU1-COMP	GP-DU1-01 GP-DU1-02 GP-DU1-03	individual cores and composite	Yes	Yes
GP-DU2-COMP	GP-DU2-01 GP-DU2-02 GP-DU2-03	individual cores and composite	Yes	Yes
GP-DU3-COMP	GP-DU3-01 GP-DU3-02 GP-DU3-03	individual cores and composite	Yes	Yes
GP-DU4-COMP	GP-DU4-01 GP-DU4-02 GP-DU4-03	individual cores and composite	Yes	Yes
GP-DU5-COMP	GP-DU5-01 GP-DU5-02 GP-DU5-03	individual cores and composite	Yes	Yes
GP-DU6-COMP	GP-DU6-01 GP-DU6-02 GP-DU6-03	individual cores and composite	Yes	Yes
GP-DU7-COMP	GP-DU7-01 GP-DU7-02 GP-DU7-03	individual cores and composite	Yes	Yes
GP-DU8-COMP	GP-DU8-01 GP-DU8-02 GP-DU8-03	individual cores and composite	Yes	Yes
GP-DU9-COMP	GP-DU9-01 GP-DU9-02 GP-DU9-03	individual cores and composite	Yes	Yes
GP-DU10-COMP	GP-DU10-01 GP-DU10-02 GP-DU10-03	individual cores and composite	Yes	Yes

Table 9

Analyzed Parameters, Recommended Analytical Methods, and Target Detection Limits for Sediment and Tissue Samples

Analyzed Parameter	Recommended Analytical Method	Units	Sediment Target Detection Limit[1] (dry wt)	Tissue Target Detection Limit[1] (wet wt)
Physical and Conventional Parameters				
Total Solids	Plumb 1981	% wet wt	0.1	--
Grain Size	Plumb 1981 or ASTM 2002	% retained	0.1	--
Specific Gravity	Plumb 1981	g/cc	0.1	--
pH	ASTM 9045D	--	0.1	--
TPH – Diesel Range	USEPA 8015	mg/kg	5	--
TPH – Residual Range	USEPA 8015	mg/kg	10	--
Lipids	Bligh and Dyer 1959	%	--	0.01
Total Organic Carbon	USEPA 9060	%	0.1	--
Metals				
Arsenic	USEPA 6020	mg/kg	1	0.2
Cadmium	USEPA 6020	mg/kg	0.1	0.1
Chromium	USEPA 6020	mg/kg	1	1
Copper	USEPA 6020	mg/kg	1	1
Lead	USEPA 6020	mg/kg	0.5	0.2
Mercury	USEPA 7471	mg/kg	0.05	0.02
Nickel	USEPA 6020	mg/kg	1	1
Selenium	USEPA 6020	mg/kg	1	1
Silver	USEPA 6020	mg/kg	0.2	0.2
Zinc	USEPA 6020	mg/kg	1	1
PAHs				
1-Methylnaphthalene	USEPA 8270	µg/kg	20	20
2-Methylnaphthalene	USEPA 8270	µg/kg	20	20
Acenaphthene	USEPA 8270	µg/kg	20	20
Acenaphthylene	USEPA 8270	µg/kg	20	20
Anthracene	USEPA 8270	µg/kg	20	20
Benzo(a)anthracene	USEPA 8270	µg/kg	20	20
Benzo(a)pyrene	USEPA 8270	µg/kg	20	20
Benzo(b)fluoranthene	USEPA 8270	µg/kg	20	20
Benzo(g,h,i)perylene	USEPA 8270	µg/kg	20	20
Benzo(k)fluoranthene	USEPA 8270	µg/kg	20	20
Chrysene	USEPA 8270	µg/kg	20	20
Dibenz(a,h)anthracene	USEPA 8270	µg/kg	20	20

Table 9

Analyzed Parameters, Recommended Analytical Methods, and Target Detection Limits for Sediment and Tissue Samples

Analyzed Parameter	Recommended Analytical Method	Units	Sediment Target Detection Limit[1] (dry wt)	Tissue Target Detection Limit[1] (wet wt)
Fluoranthene	USEPA 8270	µg/kg	20	20
Fluorene	USEPA 8270	µg/kg	20	20
Indeno(1,2,3-cd)pyrene	USEPA 8270	µg/kg	20	20
Naphthalene	USEPA 8270	µg/kg	20	20
Phenanthrene	USEPA 8270	µg/kg	20	20
Pyrene	USEPA 8270	µg/kg	20	20
Semi-Volatiles				
Pentachlorophenol	USEPA 8270C SIM	µg/kg	100	100
Organotins				
Monobutyltin	Krone et al. 1989	µg/kg	10	10
Dibutyltin	Krone et al. 1989	µg/kg	10	10
Tributyltin	Krone et al. 1989	µg/kg	10	10
PCB Congeners				
PCB 8	USEPA 8082	µg/kg	1.0	1.0
PCB 18	USEPA 8082	µg/kg	1.0	1.0
PCB 28	USEPA 8082	µg/kg	1.0	1.0
PCB 44	USEPA 8082	µg/kg	1.0	1.0
PCB 49	USEPA 8082	µg/kg	1.0	1.0
PCB 52	USEPA 8082	µg/kg	1.0	1.0
PCB 66	USEPA 8082	µg/kg	1.0	1.0
PCB 77	USEPA 8082	µg/kg	1.0	1.0
PCB 87	USEPA 8082	µg/kg	1.0	1.0
PCB 101	USEPA 8082	µg/kg	1.0	1.0
PCB 105	USEPA 8082	µg/kg	1.0	1.0
PCB 118	USEPA 8082	µg/kg	1.0	1.0
PCB 126	USEPA 8082	µg/kg	1.0	1.0
PCB 128	USEPA 8082	µg/kg	1.0	1.0
PCB 138	USEPA 8082	µg/kg	1.0	1.0
PCB 153	USEPA 8082	µg/kg	1.0	1.0
PCB 156	USEPA 8082	µg/kg	1.0	1.0
PCB 169	USEPA 8082	µg/kg	1.0	1.0
PCB 170	USEPA 8082	µg/kg	1.0	1.0
PCB 180	USEPA 8082	µg/kg	1.0	1.0

Table 9

Analyzed Parameters, Recommended Analytical Methods, and Target Detection Limits for Sediment and Tissue Samples

Analyzed Parameter	Recommended Analytical Method	Units	Sediment Target Detection Limit[1] (dry wt)	Tissue Target Detection Limit[1] (wet wt)
PCB 183	USEPA 8082	µg/kg	1.0	1.0
PCB 184	USEPA 8082	µg/kg	1.0	1.0
PCB 187	USEPA 8082	µg/kg	1.0	1.0
PCB 195	USEPA 8082	µg/kg	1.0	1.0
PCB 206	USEPA 8082	µg/kg	1.0	1.0
PCB 209	USEPA 8082	µg/kg	1.0	1.0
Pesticides				
4,4-DDD	USEPA 8081	µg/kg	10	2
4,4-DDE	USEPA 8081	µg/kg	10	2
4,4-DDT	USEPA 8081	µg/kg	10	2
Aldrin	USEPA 8081	µg/kg	10	2
Chlordane & Derivatives	USEPA 8081	µg/kg	10	2
Dieldrin	USEPA 8081	µg/kg	10	2
Endosulfan & Derivatives	USEPA 8081	µg/kg	10	2
Endrin & Derivatives	USEPA 8081	µg/kg	10	2
Heptachlor & Derivatives	USEPA 8081	µg/kg	10	2
Hexachlorocyclohexane (Lindane) & Derivatives	USEPA 8081	µg/kg	10	2
Methoxychlor	USEPA 8081	µg/kg	10	2
Toxaphene	USEPA 8081	µg/kg	50	50

Notes:

[1].Detection Limits may vary due to moisture content of sample.

µg/kg - microgram per kilogram

mg/kg - milligram per kilogram

g/cc - gram per cubic centimeter

-- - not applicable

SIM - selective ion monitoring

wt - weight

Table 10

Sample Handling Requirements for Sediment and Tissue Samples

Parameter	Method	Sample Size	Container	Holding Time	Preservation
Sediment					
Grain Size/ Specific Gravity	Plumb 1981 or ASTM 2002/Plumb 1981	500 g	500 mL HDPE	6 months	Cool/4°C
pH	USEPA 9040C	10 g	From total solids container	7 days	Cool/4°C
TPH – Residual Range	USEPA 8015	10 g	2-oz glass	14 days	Cool/4°C No headspace
Metals	USEPA 6020; USEPA 7471 for mercury	50 g	250 mL glass	6 months; 28 days for mercury	Cool/4°C
				2 years (except mercury)	Freeze/-18°C
Total Solids/TOC	Plumb 1981/ USEPA 9060	10 g	From metals jar	14 days	Cool/4°C
				6 months	Freeze/-18°C
PAHs/ Organotins/ PCBs/Pesticides/TPH - DX	USEPA 8270/ Krone et al. 1989/ USEPA 8082/ USEPA 8081/ USEPA 8015	150 g	500 mL glass	Extracted within 14 days	Cool/4°C
				Extracted within 1 year	Freeze/-18°C
				Analyzed within 40 days of extraction	Cool/4°C
Tissue					
Lipids	Bligh and Dyer 1959	10 g	125 mL glass	1 year	Freeze/-18°C
Metals	USEPA 6020; USEPA 7471 for mercury	100 g	250 mL glass	1 year	Freeze/-18°C
PAHs/PCBs/ organotins/pesticides	USEPA 8270/ Krone et al. 1989/ USEPA 8082/ USEPA 8081	150 g	500 mL glass	Extracted within 1 year	Freeze/-18°C
				Analyzed within 40 days of extraction	Cool/4°C

Notes:

g - gram
mL - milliliter

Table 11

Sample Handling Requirements for Site Water and Elutriate Samples

Parameter	Method	Container	Holding Time	Preservation
Ammonia	USEPA 350.1	500 mL HDPE	28 days	Cool/4°C, H_2SO_4
Cyanide	USEPA 335.2	500 mL HDPE	14 days	Cool/4°C, NaOH
Total metals	USEPA 200.8 or 6020	250 mL HDPE	6 months	Cool/4°C, HNO_3
Dissolved metals	USEPA 200.8 or 6020	250 mL HDPE	6 months	Filter; Cool/4°C, HNO_3
Total mercury	USEPA 245.1 or 7470	250 mL HDPE	28 days	Cool/4°C, HNO_3
Dissolved mercury	USEPA 245.1 or 7470	250 mL HDPE	28 days	Filter; Cool/4°C, HNO_3
Chromium, Hexavalent (Cr+6)	USEPA 7196A	250 mL HDPE	24 hours	Cool/4°C
Pesticides	USEPA 8081	1000 mL amber glass	Extracted within 7 days of collection and analyzed within 40 days of extraction	Cool/4°C
Pentachlorophenol	USEPA 8151 Modified or 8270C SIM	1000 mL amber glass	Extracted within 7 days of collection and analyzed within 40 days of extraction	Cool/4°C
Tributyltin	Krone et al. 1989	1000mL amber glass	Extracted within 7 days of collection and analyzed within 40 days of extraction	Cool/4°C

Notes:

°C - degree Celsius

mL - milliliter

Table 12

Recommended Analytical Parameters, Methods, and Target Detection Limits for Site Water and Elutriate Samples

Analyzed Parameter	Recommended Analytical Method	Units	Target Detection Limit
Metals			
Arsenic	USEPA 200.8 or 6020	µg/L	1
Cadmium	USEPA 200.8 or 6020	µg/L	1
Chromium, Total[1]	USEPA 200.8 or 6020	µg/L	1
Chromium, Hexavalent (Cr+6)	USEPA 7196A	µg/L	1
Copper	USEPA 200.8 or 6020	µg/L	1
Lead	USEPA 200.8 or 6020	µg/L	1
Mercury	USEPA 245.1 or 7470	µg/L	0.2
Nickel	USEPA 200.8 or 6020	µg/L	1
Selenium	USEPA 270.2, 270.3, 7740, 7741, or 7742	µg/L	2
Silver	USEPA 200.8 or 6020	µg/L	1
Zinc	USEPA 200.8 or 6020	µg/L	1
Nonmetals			
Ammonia	USEPA 350.1	µg/L	30
Cyanide	USEPA 335.2	µg/L	10
Tributyltin	Krone et al. 1989	µg/L	0.01
Semi-Volatiles			
Pentachlorophenol	USEPA 8151 Modified or 8270C SIM	µg/L	10
Pesticides			
Aldrin	USEPA 8081	µg/L	0.5
Chlordane	USEPA 8081	µg/L	0.05
Dieldrin	USEPA 8081	µg/L	0.1
DDT	USEPA 8081	µg/L	0.5
alpha-Endosulfan	USEPA 8081	µg/L	0.03
beta-Endosulfan	USEPA 8081	µg/L	0.03
Endrin	USEPA 8081	µg/L	0.03
gama-BHC (Lindane)	USEPA 8081	µg/L	0.1
Heptachlor	USEPA 8081	µg/L	0.05
Heptachlor Epoxide	USEPA 8081	µg/L	0.05
Toxaphene	USEPA 8081	µg/L	0.2

Notes:

1. If hexavalent chromium (Cr+6) cannot be analyzed within holding time, total chromium will be run in its place.

µg/L - microgram per liter

SIM - selective ion monitoring

Table 13

Analyzed Parameters, Analysis Methods, and Targeted Reporting Limits for TCLP

Analyzed Parameter	Recommended Preparation Method	Recommended Analytical Method	Units	Reporting Limit
Metals				
Arsenic	USEPA 1311/3010A	USEPA 6010B	µg/L	200
Barium	USEPA 1311/3010A	USEPA 6010B	µg/L	12
Cadmium	USEPA 1311/3010A	USEPA 6010B	µg/L	8
Chromium	USEPA 1311/3010A	USEPA 6010B	µg/L	20
Lead	USEPA 1311/3010A	USEPA 6010B	µg/L	80
Mercury	USEPA 1311/3010A	USEPA 6010B	µg/L	0.4
Selenium	USEPA 1311/3010A	USEPA 6010B	µg/L	200
Silver	USEPA 1311/3010A	USEPA 6010B	µg/L	12

Notes:

µg/L - micrograms per Liter

Table 14
Proposed Biological Testing

Parameter	SP Tests	SPP Tests	BP Tests
Test Species	Amphipod *L. plumulosus*, Polychaete *Neanthes arenaceodentata*	Bivalve Larvae *Mytilus edulis*, Mysid Shrimp *A. bahia*, Fish *M. beryllina*	Bivalve *M. nasuta*, Polychaete *N. virens*
Reference Sediment	SERIM RS-GP-C and RS-PAS-A reference sites	N/A	SERIM RS-GP-C and RS-PAS-A reference sites
Control	Clean sediment provided by the organism supplier	Natural seawater or artificial seawater, and site water	Clean sediment provided by the organism supplier
Reference Toxicant Test	Yes	Yes	N/A

Notes:
N/A - not applicable

FIGURES

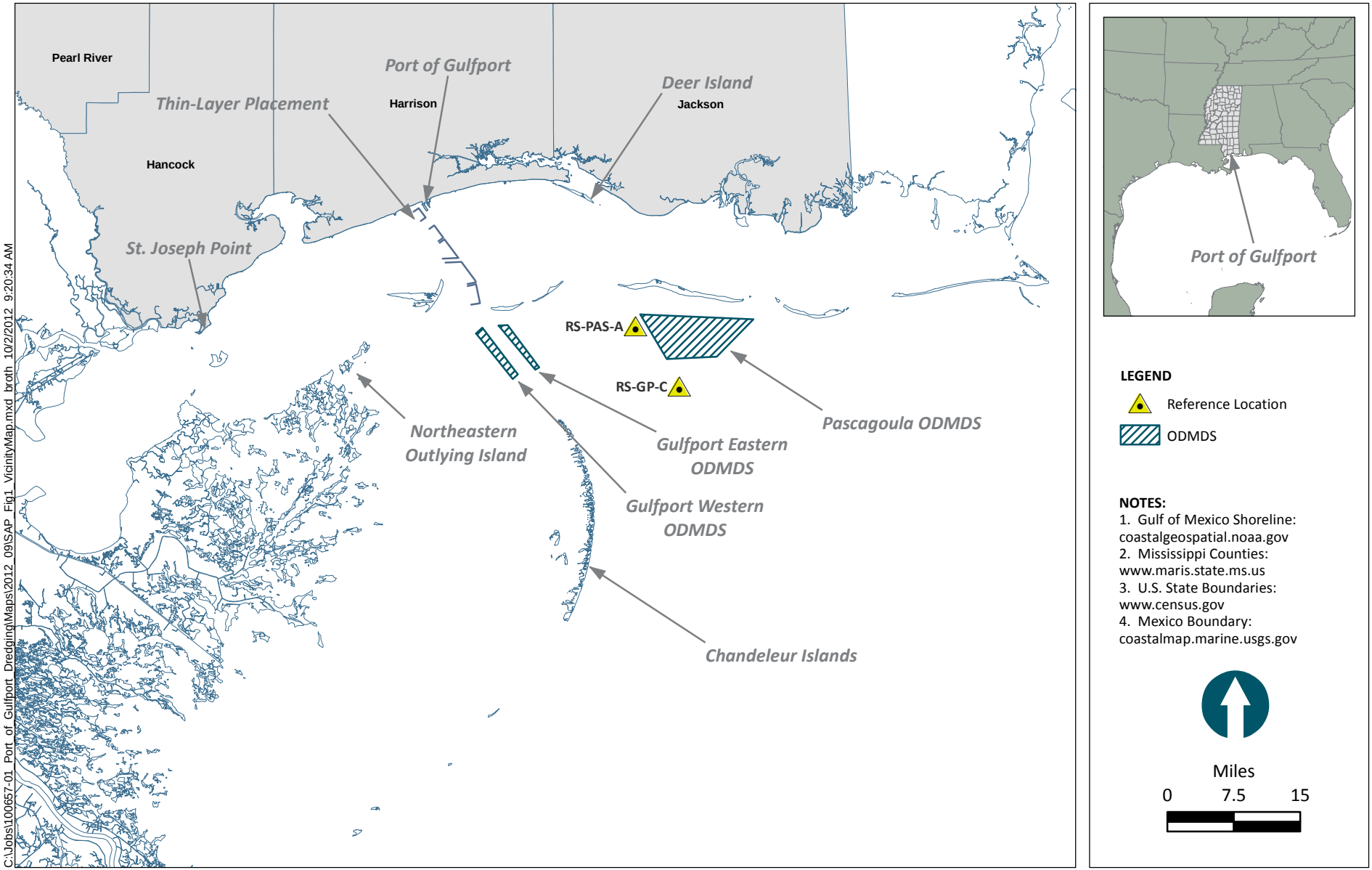


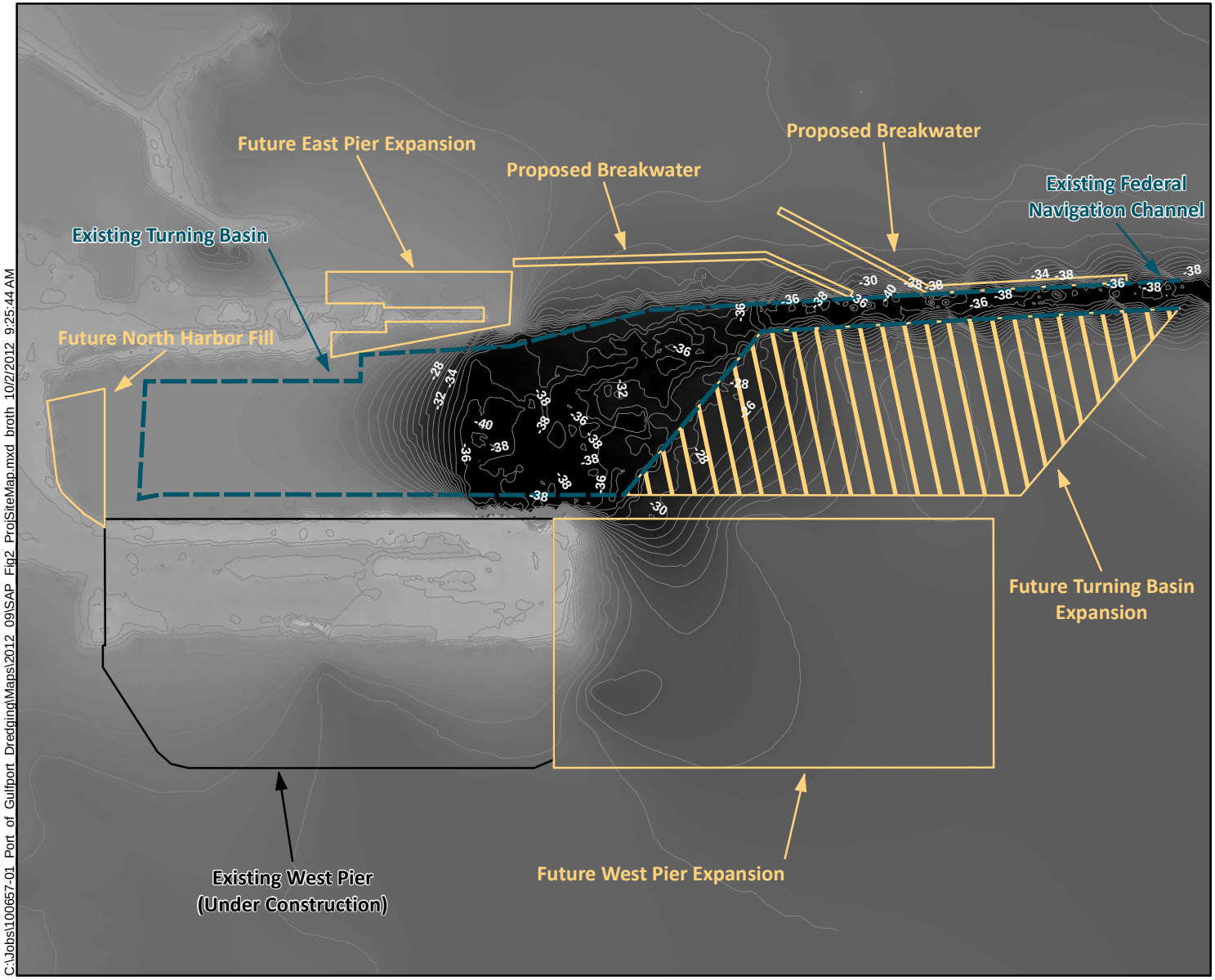
Figure 1

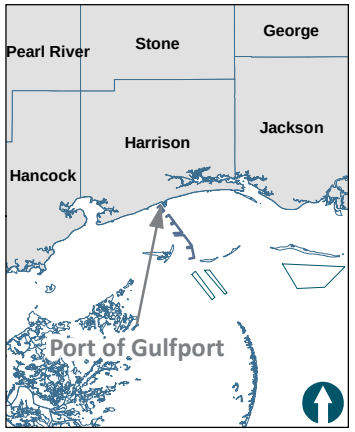
Vicinity Map

Sampling and Analysis Plan for Dredged Material Evaluation: Gulfport Turning Basin Expansion

Mississippi State Port Authority - Port of Gulfport

ANCHOR QEA





LEGEND

NOAA Digital Elevation Model

Value

High : 34.125

Low : -42.2898

NOTES:

1. Gulf of Mexico Shoreline: coastalgeospatial.noaa.gov
2. Mississippi Counties: www.maris.state.ms.us
3. Digital Elevation Model: NOAA 2008
4. Expansion Alignment: CH2M HILL 2011

Feet

0 375 750 1,500

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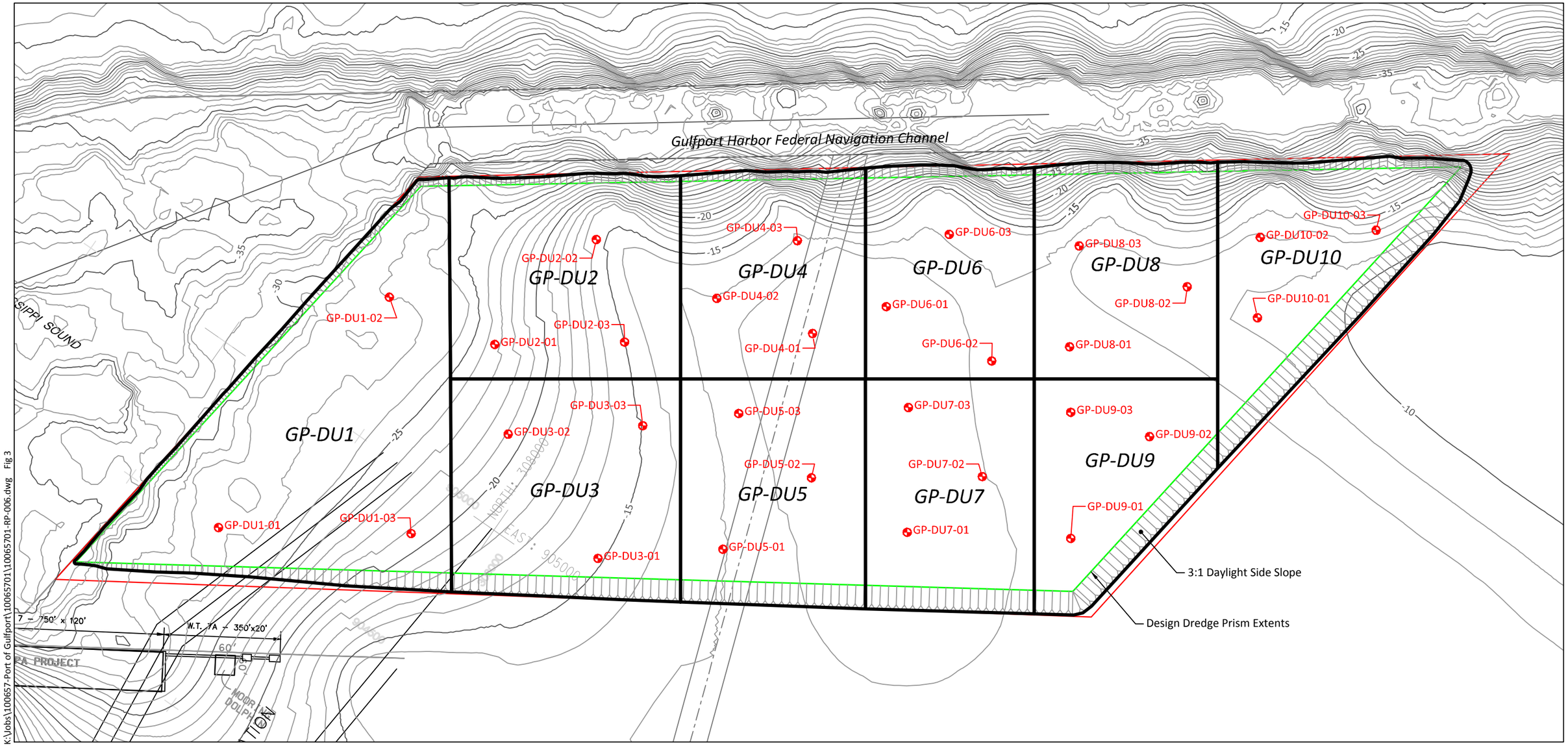
Figure 2

Project Site Map

Sampling and Analysis Plan for Dredged Material Evaluation: Gulfport Turning Basin Expansion

Mississippi State Port Authority - Port of Gulfport

ANCHOR QEA



K:\Jobs\100657-Port of Gulfport\10065701\10065701-RP-006.dwg Fig 3

Oct 20, 2011 2:36pm tgriga

SOURCE: Bathymetry from NOAA (January 2008)
HORIZONTAL DATUM: Mississippi State Plane East, NAD83, U.S. Survey Feet
VERTICAL DATUM: Mean Lower Low Water (MLLW)

LEGEND:

GP-DU3-01 Proposed Sample Location

-15 Bathymetry Contour (1 ft)

0 300
Scale in Feet

Figure 3
Dredge Unit Boundaries and Proposed Sample Locations
Sampling and Analysis Plan for Dredged Material Evaluation: Gulfport Turning Basin Expansion
Mississippi State Port Authority - Port of Gulfport

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APPENDIX A
SEDIMENT CORE COLLECTION FORM

Sediment Core Collection Form

Station ID: _____ **Date:** _____

Project Name: _____ **Project Number:** _____

Coordinates:
Lat/Northing _____ Long/Easting: _____

Vertical Datum MLLW MLW Other: _____

Depth Measurement Sounder Leadline

Project Depth _____ **Overdredge** _____

	Attempt 1	Attempt 2	Attempt 3
Time Start:			
(A) Measured Water Depth			
(B) Tide Height			
(C) Mudline Elevation			
(-A+B = C include sign of tide height as reported)			
Estimated Penetration Length			
Description of Core Drive			
Refusal Encountered?			
Total Core Recover Length			
Time End:			

Core Characteristics

Sediment Type	cobble, gravel, sand C M F , silt clay, organic matter	cobble, gravel, sand C M F , silt clay, organic matter	cobble, gravel, sand C M F , silt clay, organic matter
Sediment Color	gray, black, brown brown surface, olivine	gray, black, brown brown surface, olivine	gray, black, brown brown surface, olivine
Sediment Odor	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic	None, slight, mod, strong H_2S, petroleum, septic
Any Layering Homogeneous			
Comments:			

Recorded by: _____